CONDENSED CATALOGUES OF MECHANICAL EQUIPMENT

WITH
GENERAL CLASSIFIED DIRECTORY
AND
CONSULTING ENGINEERS' DIRECTORY

TENTH ANNUAL VOLUME 1920

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

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CONDENSED CATALOGUES

OF

MECHANICAL EQUIPMENT

COMPRISING CONDENSED, UNIFORMLY PRESENTED AND ILLUSTRATED CATALOGUE INFORMATION COVERING THE PRODUCTS OF MANUFACTURERS OF VARIOUS CLASSES OF MECHANICAL EQUIPMENT

WITH

GENERAL CLASSIFIED DIRECTORY

A SPECIALIZED CROSS-INDEXED CLASSIFIED LIST OF MECHANICAL EQUIPMENT WITH THE NAMES AND ADDRESSES OF THE MANUFACTURERS

AND

CONSULTING ENGINEERS DIRECTORY

A CLASSIFIED LIST OF MEMBERS OF THE MERICAN SOCIETY OF MECHANICAL ENGINEERS ENGAGED.

IN VARIOUS BRANCHES OF SOCIUTINO ENGINEERING PRACTICE.

TENTH ANNUAL VOLUME OCTOBER, 1920

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PREFACE

THE Tenth Annual (1920) Volume of A. S. M. E. CONDENSED CATALOGUES OF MECHANICAL EQUIPMENT is here placed at the service of the membership of the Society, and of the mechanical engineering profession at large.

In this edition, many more firms than ever before are represented by publication of catalogue data. The total number is five hundred and seventy-two, and it is worthy of remark that among them are a large proportion of the leading manufacturers in their respective lines. At the same time the number of catalogue pages has also been increased.

The general Mechanical Equipment Directory in which all eligible manufacturers are entitled to listing of their products, free of charge within reasonable limits, and the Consulting Engineers' Directory compiled from the membership of the Society, have also been extended and improved. It is believed that these reference features will prove of even greater value than heretofore.

Attention is particularly directed to the title pages of the seven main divisions of the Catalogue Section. These pages supply an alphabetical list of the products catalogued in their respective groups, thus enabling the engineer to quickly find information concerning the equipment in question. For convenience the separate lists are combined in the Table of Contents, which gives a general survey of the material contained in the volume. Directions for using the Mechanical Equipment Directory are given at the beginning of that section.

The publication of the annual volume of A. S. M. E. CONDENSED CATALOGUES OF MECHANICAL EQUIPMENT is essentially a coöperative undertaking in which the Society acts as a logical agent rather than as a publisher in the usual sense of the term. Acknowledgment is due to the many firms whose use of space has made it possible for the Society to furnish this convenient and useful reference work to the mechanical engineering profession, with the aim of affording a closer and more efficient point of contact between the user and the maker of mechanical equipment.

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NOTE.—All data presented have been edited with a view to the elimination of advertising claims or exaggerated statements and every effort made to restrict the Condensed Catalogues to firms of good standing only. Publication of catalogue data does not constitute in any sense an endorsement by the Society of the firms or products thus represented.

Extract from Constitution: C 55. The Society shall not be responsible for statements or opinions advanced in papers or in discussions.

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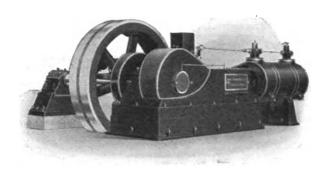
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OSWEGO, N. Y.

Branches in All Principal Cities

Builders of Steam Boilers, Engines, Tanks and General Plate Work



Ames Una-Flow Engine

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Ames Steam Boilers are built in such a variety of styles and sizes that their range of application is practically unlimited where fire tube Steam Boilers are required.

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TANKS:

Storage, Blow-off and general purpose Tanks are built in all sizes and types for every requirement.

STACKS:

Self-supporting and guyed Stacks and Smoke Connections are a specialty and built to specification throughout to suit local conditions as circumstances require.

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Ames Engines, as in the past, are the acknowledged standard for the purpose they are intended, depending on requirements. They are built of various types in sizes from 10 to 1000 H. P.

The various types comprise medium speed Side and Center Crank equipped with either throttling or automatic governor for belt drive to all kinds of equipment where a dependable steam engine is required in sizes from 10 to 400 H. P.

Heavy Duty Single Valve Side and Center Crank in sizes from 25 to 500 H. P. for medium and high speed operation of direct-connected electric generators and other heavy power service for belt drive.

Non-Releasing Corliss Four Valve for heavy duty service and medium speed operation of electric generators and general power plant work for non-condensing operation where high economy is essential, and is built in sizes from 150 to 500 H. P.

UNA-FLOW ENGINES:

The Ames Una-Flow Engine is without a doubt the last word in the art of design, construction and product for a steam power plant.

They are built in sizes from 50 to 1000 H. P. for either condensing or non-condensing operation and maximum economy in the use of steam is the result. Poppet valves are employed throughout in all sizes. The Engines are of the heavy duty side crank construction for the most satisfactory service for every power plant requirement.

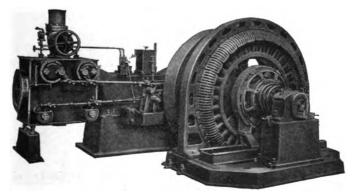
May we advise you why the Una-Flow Engine is the most efficient prime mover yet developed? Our Engineering Department is at your service and will gladly consult with you.

Bulletin illustrating and describing any of the above will be furnished on request.

BALL ENGINE CO.

ERIE, PENNSYLVANIA

Builders of Corliss-Valve and Single-Valve Engines; Horizontal and Vertical Side-Crank Engines; Tandem- and Cross-Compound Single-Valve Engines, Corliss-Valve Compound and Single-Cylinder Engines



Horizontal Single-Cylinder Side-Crank Engine-Corliss Type

BALL HIGH-SPEED CORLISS ENGINES:

The feature which distinguishes this engine from other four-valve shaft-governed engines is the patented non-detaching valve gear, which imparts the same movement to the valves that the drop cut-off of the slow-speed Corliss produces by picking up and dropping them. This permits the use of the best form of valve, and the valves are given the movement necessary for the greatest durability and tightness.

Built in sizes from 100 H. P. to 1600 H. P. in the single-cylinder and cross-compound types.

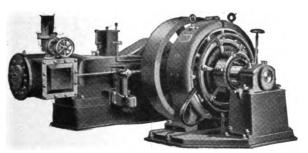
These engines excel in economy and regulation and are especially adapted for electric service.

BALL SINGLE-VALVE AUTOMATIC ENGINES:

These engines are the result of a long experience in building engines for electric service. They are superior in design and construction. The regulation and economy are the best of their type.

Built in sizes from 25 H. P. to 800 H. P. in the single-cylinder tandem-compound and cross-compound types.





Single-Cylinder Side-Crank Engine-Single-Valve Type

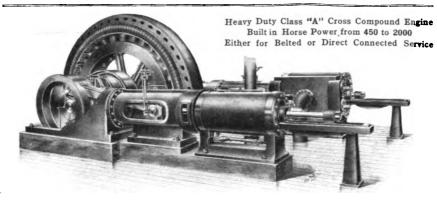
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5

BUCKEYE ENGINE COMPANY

SALEM, OHIO

Manufacturers of Horizontal and Vertical; Simple, Tandem Compounded and Cross Compounded; and Marine Steam Engines; Gas Engines; Buckeye Mobile Steam Plants



BUCKEYE ENGINES:

When a product is carefully and correctly designed on well founded truths; produced in materials, chemically and physically fitted to the task; and fabricated by careful workmen directed by a policy of "the best is none too good," that product must be a success. Therein is the reason for the Buckeye Engine popularity.

Standard Buckeye engines are designed for steam pressures of 125 lbs. and over; special engines as high as 200 lbs.

Buckeye engines are made in horizontal and vertical types. The horizontal are built in three general speeds; vertical engines are built for medium speeds.

Built for Condensing or Non-condensing service.

SPECIFICATIONS OF BUCKEYE STEAM ENGINES

Class	Туре	H. P. Class Range	R. P. M. Class Range
A	Simple	225-1200	
	Tandem	250-1200	75-110
	Cross Compound	450-2000	
В	Simple	30-1000	
	Tandem	80-1000	120-230
	Cross Compound	60-1600	
С	Simple	20-600	
	Tandem	60-600	165-325
Vertical	Simple	50-1000	
	Cross Compound	100-2000	120-250

Points of Superiority of Buckeye Engines:

- 1. Exceptional weight and strength of parts
- 2. Large extent of wearing surfaces
- 3. Design, workmanship and material
- 4. Great durability-simplicity
- 5. Perfect adjustments
- 6. Compensation for wear on all parts
- 7. Wide range of power: adjustable to any reasonable speed
- 8. Great economy due to fineness of design
- 9. An investment, not an expense
- 10. Dependable power at low cost

Send for complete bulletins.



Heavy Duty Vertical Cross Compound Engine

ERIE ENGINE WORKS

ERIE, PA.

Manufacturers of "Victor" Steam Engines

SPECIAL SALES REPRESENTATIVES

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CHICAGO—MAHER ENGINEERING Co., 818-819 Michigan Boulevard Bldg.

CLEVELAND—MAHER ENGINEERING Co. Schofield Bldg.

BOSTON—SCHUMAKER-SANTRY Co. 141 Milk St.

PHILADELPHIA—OTTO C. REYMAN 1304 Pennsylvania Bldg.

"VICTOR" VERTICAL STEAM ENGINES:

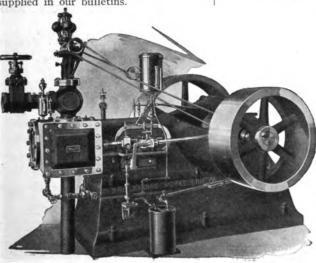
These engines are adapted, as will be appreciated, to furnish power for all requirements where this style engine is applicable, whether direct connected or belted, and with either automatic or throttling governor.

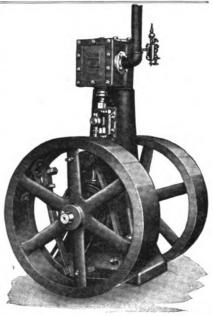
The fact that these engines have been approved and adopted by large manufacturers of generators, blowers, pumps, stokers, etc., is evidence that they are all that could be required for continuous, satisfactory service.

These are the heavy duty, fully enclosed type, and have complete automatic lubrication throughout. Specifications and full description are contained in our special bulletin issued which we solicit an opportunity to furnish.

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This line of heavy duty, high speed, enclosed, automatic and throttling Victor horizontal engines we are prepared to furnish in sizes from 6 to 350 H. P. Full specifications and description in detail are supplied in our bulletins.





We can furnish them with our standard gravity lubrication, or with complete automatic pump lubrication as illustrated in cut at left. 7

For requirements within this range of sizes we can make most attractive offerings as our product is produced under the most favorable conditions.

Quotations and complete bulletins on application.

STEAM ENGINE BUILDERS FOR 40 YEARS

The HOOVEN, OWENS, RENTSCHLER Co.

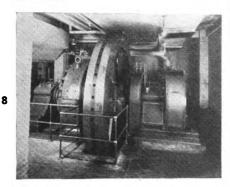
HAMILTON, OHIO

Designers and Builders of Hamilton-Corliss, Slow and Medium Speed Engines; Poppet Valve and Uniflow Medium and High Speed Engines; Blowing Engines; Compressors; Gas and Gas-Steam Engines. Designers and Makers of Sugar Mill Crushing Machinery and Engines. All Kinds of Heavy Iron or Semi-steel Castings Made and Machined

HAMILTON-CORLISS ENGINES:

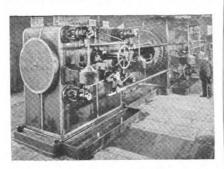
Nearly five thousand Hamilton-Corliss engines are supplying power in hundreds of industries. The first engine, built in 1882, is still in perfect running order.

Simple, Cross-compound, Tandem—any design and size built for any kind of work. Particularly suited for exceptionally heavy work or where conditions demand absolute reliability of operation.



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Hamilton Poppet Valve and Poppet Valve Uniflow Engines for medium-to-high speeds are designed to be used with high steam pressures and high temperature steam. These embody the most modern developments in steam engine design and consequently are highly efficient in operation.



Hamilton-Uniflow Engine

HAMILTON SUGAR MILLS AND ENGINES:

Hamilton Sugar Mills and Engines are installed in some of the biggest "Centrals" in Cuba.

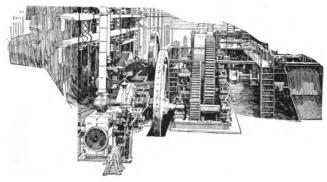
The engines have demonstrated their ability to stand up season after season through the heaviest grinding periods. Hamilton Mills have ground through entire seasons and macerated a daily feed of 25% more cane than their scheduled capacity with a juice extraction percentage of 79.5. One "Central" produced 511,000 bags of

sugar without a single inter- ENGINEERING

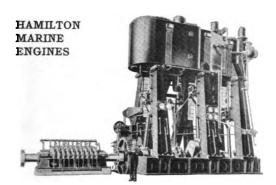
ruption of service in the plant.

TheHOOVEN, OWENS, RENTSCHLER Co.

HAMILTON, OHIO



Central Australia, Jaguey Grande, Cuba. Hamilton Engines, Crushers and Mills



Hamilton 2800 H. P. Marine Engine

Hamilton Marine Engines are standardized in sizes from 500 to 5,000 h. p.

We have all the patterns, tools, jigs, etc., for making every part interchangeable; for getting exact dimensions and uniform quality in every engine. Multiple machining enables us to produce



S. S. "Eelbeck" Driven by a Hamilton Engine

marine engines on a low-cost basis and to give definite delivery dates which invariably are met.

We worked up our production to four complete 2800 h. p. engines a week during the war emergency—which gives a true conception of our present facilities for turning out a large volume of standard marine engines with peace-time finish and rigid quality in every nut and bolt.

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In addition to products enumerated, we build blowing engines for blast furnaces, gas engines and gas-steam engines. We built the 60,000 h. p. power plant of Henry Ford at Detroit.

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We make and machine heavy castings of all descriptions—rolling mill equipment, plate glass tables; cylinders on new or repair jobs, or any other large units.

Our engineering department is ready to answer any questions or help to solve any problem in steam engineering. Write.

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FRANKLIN MACHINE COMPANY

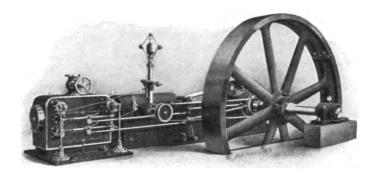
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P. O. Address Box 1393, PROVIDENCE, R. I.

Franklin Plant and Foundry 189 Charles St.

HARRIS-CORLISS PLANT Park and Promenade St.

Manufacturers of Steam Engines, Transmission Machinery, Special Textile Machinery, Spun Silk Machinery, Machines for Steel, Rubber and Paper Mills, Gray Iron Castings, All Kinds of General Repairs and Mill Work



Valve Gear Side Simple Harris-Corliss Engine, Extra Heavy Duty Type

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IMPROVED ENGINES with Brown Patented Valve Releasing Gear.

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Shoe Pins

Shoe Sticks

Shoe Stands

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Take Up for Yarn Dressers

Cotton Bat Heads

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Brown Valve Gears

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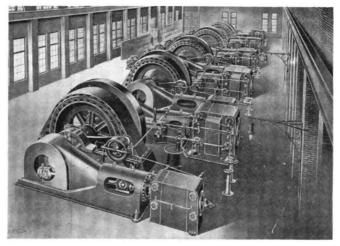
Shafting Couplings Bearings

PROVIDENCE ENGINEERING CORP'N

PROVIDENCE, R. I., U. S. A.

NEW YORK OFFICE: 5 NASSAU ST.

Builders of Stationary and Marine Engines



Five 1000 K. W. Rice and Sargent Corliss Engines

Sizes: Simple engines 150 H. P. and up. Compound 300 to 10,000 H. P.

Speeds: 150 R. P. M. and higher up to 1000 H. P. Proportional speeds on larger sizes.

Valve Gear: Patented releasing gear without wrist plates, hook rods, spring latches, etc. Double and triple ported valves. Long range cut-off (80%) vacuum and spring dashpots.

Frame: Heavy duty or rolling mill type, cast in one piece.

Governor: Patented Sargent, with closest possible (1%) regulation.

Safety: Our own built-in safety stop entirely separate from the governor.

Friction: Not over 3%. Economy: Unequaled.

There has never been a flywheel accident on a Rice & Sargent engine.

Marine Engines, Surface Condensers and Equipment.

Large, well-equipped shops and competent engineering staff available at all times for production work on general machinery and parts to plans and specifications.

Quantity production on automobile parts to close limits a specialty.

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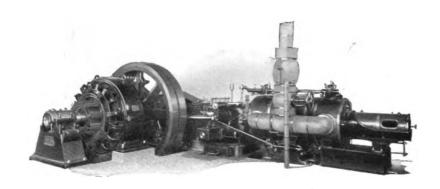
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SKINNER ENGINE COMPANY

ERIE, PA., U. S. A.

BRANCHES IN ALL LARGE CITIES

Builders of High-Economy Steam Engines



12

"UNIVERSAL UNAFLOW"

engines are built in both center crank and side crank types, and are designed to give the maximum economy obtainable, with high or low pressure, condensing or noncondensing, and with or without superheat.

Its expansion-compensating poppet valves insure the original economy being indefinitely maintained.

This engine automatically changes its functions to operate both condensing and noncondensing without manual adjustment, with small clearances and consequently best economy.

Over forty patents, owned by us, prevent the use of our exclusive features by others, and make the



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"THE MOST ECONOMICAL STEAM

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Engineers and Designers of High Efficiency Nordberg-Todd Uniflow Poppet Valve Engines, Corliss Engines, High Compression Oil Engines, Nordberg-Carels Diesel Type Engines, Air Compressors, Blowing Engines and Steam, Air and Electric Mine Hoists

UNIFLOW POPPET VALVE ENGINES:

Nordberg-Todd Uniflow Poppet Valve Engines will carry a widely fluctuating load with lower average steam consumption than any other type of steam prime mover. They can be operated condensing or noncondensing, with high back pressure or vacuum and with any degree of superheat and steam pressure. The sizes range from 200 to 2000 H. P.

CORLISS ENGINES:

Nordberg Corliss Engines are made in all sizes with both standard and long range valve gear. They are known the world over for their reliability and high efficiency.

HIGH COMPRESSION OIL ENGINES:

The Nordberg Two-Cycle Oil Engine is the simplest on the market today. They have no valve gears or valves subjected to working pressure and heat. A low pressure piston valve for scavenging air is the only one used. Made in sizes from 50 to 550 B. H. P.

NORDBERG-CARELS DIESEL ENGINES:

These engines are made for either constant or variable speed operation. They are particularly well adapted for operation in high elevations and for continuous non-stop service. In sizes from 330 to 3000 B. H. P. they are suitable for heavy duty work and are exceptionally economical in fuel consumption.

ELECTRIC HOISTS:

Many of the notable coal and metal mine hoists have been made by Nordberg. They are especially well known for their safety features, speed and size—one that has achieved considerable fame, the Inspiration Copper Co. Hoist, is entirely automatic in its operation.

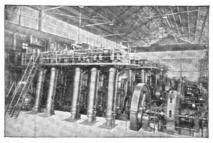
STEAM AND AIR HOISTS:

Nordberg Steam Hoists are well known to all mining men. All of the successful compound condensing and all the Air Hoists are of Nordberg make.

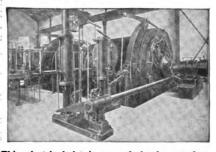
Bulletins on any of the above apparatus sent on request.



Because of their ability to maintain exceptionally low steam consumption when operating with widely fluctuating loads, Nordberg-Todd Uniflow Poppet Valve Engines are recommended for steam plant installations.



A large installation of Nordberg Carels Diesel Type Oil Engines consisting of four 1250 B. H. P. engines direct connected to generators and one 750 B. H. P. engine direct connected to 4000 cu. ft. air compressor. This installation is at the Burro Mountain Copper Co., Tyrone, New Mexico.



This electric hoist is one of the largest first motion hoists used in this country. It is equipped with two drums 10 feet in diameter and winds 3500 feet of rope at a speed of 2500 feet per minute. Nordberg made it for Elm Orlu Mining Co., Butte, Montana.

13

TROY ENGINE & MACHINE CO.

TROY, PENNSYLVANIA

Manufacturers of Center-Crank Steam Engines



TROY ENGINES:

Back of the Troy engine stand 30 years of specialized effort to produce the best engine selected materials, skilled workmen and engineering experts are capable of. We are therefore justly proud of the world-wide reputation for excellent efficient service which the Troy engines have gained.

Troy engines are especially adapted for and give excellent service in driving:

Generators Fans Compressors Positive Pressure Dryers Blowers Scrubbers Centrifugal Pumps Auxiliary Equipment Rotary Pumps in large plants

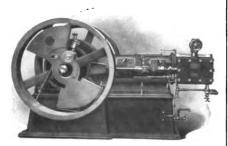
The standard Troy Engines are The standard Troy Engines are Interest the listed below. Column P gives the ENGINEERING maximum usual pressure and Column S the number of sizes made.



Troy Engines	P	s
Vertical Automatic	80-160 10- 40	13 8 13 8 14 9 10 6

All the above are made either enclosed and self-oiling, or open with gravity lubrication.

Sizes-2 to 100 H. P.



Horizontal Automatic Type for Belted Service



Special Type of Vertical Throttling for D. C. to Fan or Blower

All Troy Engines are built in the center-crank type and of compact and symmetrical design. The cylinder, frame and base are independent parts, machine fitted and interchangeable.

The Base is of a heavy substantial pattern enclosed for the collection of oil and water.

The Frame is of heavy construction and forms to main bearings. These are lined with the the main bearings. These best genuine babbitt metal.

The Cylinder and Steam-Chest are one casting built generously to stand a stipulated steam pressure.

The Valves are of the balanced type—always steam-tight.

The Piston is a single casting; cored center to lighten. Grooved and provided with removable packing rings to make piston steam-tight.

The Crosshead is adjustable to take up wear and is provided with thorough lubricating passages.

The Crankshaft and Connecting Rod are steel forgings. The Connecting Rod is extra long to minimize friction, save power and lengthen life of bearings.

The Self-Oiling System (patented) thoroughly lubricates, saves oil and operates automatically. The bearings run in oil, minimizing wear, and the cost of lubrication is less. The oil pump and the check valve are designed especially for this

service.

There are three types of engines made: 'Low There are three types of engines made: 'Low Pressure for steam from 10 to 35 lbs., Standard for steam at from 60 to 160 lbs. and Special engines to take care of pressures exceeding 160 lbs. and to operate on superheated steam.

Each order receives personal attention so as to adapt the engine in the nicest possible manner for the service it has to perform. Blue prints giving general dimensions can be furnished to permit you to run lines, make foundation, etc.

Catalogs mailed you upon request. Our engineering staff is also at your service in aiding you to select the proper equipment.

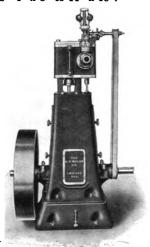
you to select the proper equipment.

THE E. H. WACHS COMPANY

1525 DAYTON ST., CHICAGO, ILL., U. S. A.

Manufacturers of Vertical Steam Engines

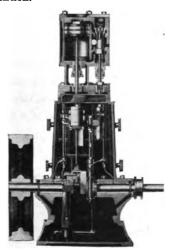
FULLY ENCLOSED AND SELF-OILING: Sizes—4" x 5" to 11" x 10".



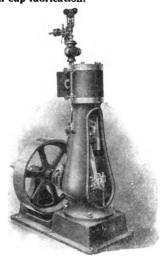
This engine is of exceptionally heavy design and liberal proportions. The fully enclosed feature makes it dust and oil proof.

The oiling system is of the gravity type supplied by an oversize pump in base, thus assuring abundant lubrication.

Built for severe service with minimum attention.



STANDARD OPEN-TYPE ENGINES: Oil cup lubrication.



Side Crank
Sizes—3"x3" to 5½"x7"

15

Shafts and connecting rods are solid steel forgings.

Center Crank Engines designed to operate at very high speeds have counter-balanced crank shafts.



Center Crank Sizes-3"x3" to 14"x16"

THE VILTER MANUFACTURING CO.

1194-1196 CLINTON ST., MILWAUKEE, WISCONSIN, U. S. A.

Builders of Ice Making and Refrigerating Machinery, Corliss Engines, Poppet Valve Engines, Ammonia Valves and Fittings, Ammonia Condensers, Special Machinery, Etc.

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519 Beatty Bldg.
HOUSTON, TEXAS
O'Reilly 9
HAVANA, CUBA

VILTER TANDEM COMPOUND POPPET VALVE ENGINE:



Fig. I

Fig. 1. Vilter Tandem Compound Engine shown with poppet high pressure and Corliss low pressure cylinder direct connected to Rolling Mill type compressor. The most economical combination known using high pressure superheated steam. A leading feature is the valve gear operated through wrist plates driven from eccentrics.

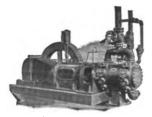


Fig. 2

Fig. 2. Vilter horizontal high speed ammonia compressors are simple in design, rugged in appearance, and in the character of service they give. They are specially designed for direct connection to the newest types of high-speed prime movers, and particularly adapted for direct connection to synchronous motors, a method of drive which is proving so highly economical and efficient.



Fig. 3

Fig. 3. The Rolling Mill frame Ammonia Compressor is built along very heavy lines for all conditions of service. It is used with only slight modifications in all sizes of compressors. Its very appearance gives assurance and proof of its strength and reliability. All parts of the base rest upon the foundation, thus giving uniform distribution of the load and insuring maximum stability and rigidity.



Fig. 4

THE VILTER MANUFACTURING CO.

Fig. 4. The Rolling Mill type Corliss Engine is of massive construction throughout, the pillow block and guide being made in one casting, securing great strength and rigidity. It is adapted to any class of service from a steady belted load to direct connected electrical service.



Fig. 5

Fig. 5. The belt-driven machines are furnished in either single or duplex units. These units may be driven by electric motor, gas or oil engines, etc. Single units built in sizes from 6 to 375 tons daily refrigerating capacity, duplex units in sizes from 12 to 750 tons daily refrigerating capacity.

SMALL VERTICAL TWIN CYLINDER AMMONIA COMPRESSORS:



Fig. 6

Fig. 6. A small, single-acting compressor, especially designed for users of comparatively small quantities of refrigeration. It is reasonable in first cost. Economical to operate. Simple in construction. Needs very little attention. Is always ready for service. Built in sizes from 1 ton to 20 tons daily refrigerating capacity.

VILTER LOW TEMPERATURE COM-PRESSION SYSTEM:

A system manufactured under D. I. Davis patents whereby extremely low temperatures are efficiently and economically produced with compression refrigerating machinery. The simple ammonia compression machine has been conceded as both expensive and uneconomical for low temperature work. These detrimental features are overcome by the Low Temperature Compression System by the following methods:

- Multistage compression, which increases volumetric efficiency and reduces the power required for operating the compressors.
- (2) Cooling the liquid before entering the low temperature refrigerator, thus reducing amount of gas handled by low pressure compressor and power per ton of refrigeration—because the work of cooling is handled by the high pressure cylinder.
 - (3) Intermediate gas cooling.
 - (4) Proper traps, etc.

LITERATURE:

Bulletins, catalogues and full data regarding our products mailed on request.



CROCKER-WHEELER COMPANY

AMPERE, N. J.

Manufacturers of Electric Motors and Generators

A. C. AND D. C. GENERATORS: In All Sizes

C-W generators are known among engineers for the special care and attention given to every detail of their design and construction. Simplicity, strength and durability are their distinguishing features.

INDUCTION MOTORS: 25 and 60 Cycle—All Sizes

One of the special features of these machines is the superior insulation of the stator windings. This is rendered possible through the use of form-wound coils that are thoroughly insulated and shaped to fit the open slots in the stator. Magnetic slot-bridges are used to bridge the stator slots after the windings are in place. The power factors and efficiencies are as high as consistent with good construction and thorough insulation.

D. C. MOTORS OF ALL SIZES: 1/12 to 225 H. P.

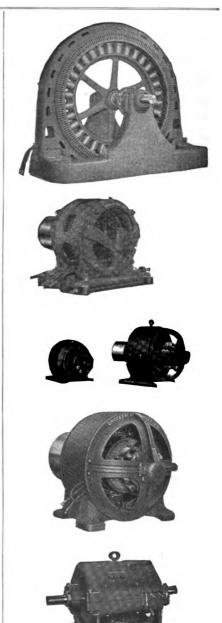
These motors are a C-W specialty. They are designed to withstand hard service and abuse. Exceptionally well-insulated windings and large bearings are employed. Special attention has been given to each detail of their design.

They are made for standard voltages in slow or moderate speed types for belt, chain, gear or direct drive.

SPECIAL STEEL MILL MOTORS:

Fire-proof insulation is used and all parts are made extra strong and heavy to withstand the shocks, jars and overloads incident to rolling-mill service. The C-W Company has made a specialty of this class of motors, and can promptly supply motors for any branch of Steel Mill Service.

Write for Bulletins.

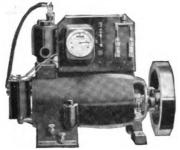


CONSOLIDATED UTILITIES CORP'N

730 S. MICHIGAN AVE., CHICAGO, ILL.

Self-contained Light and Power Plants for Marine and Industrial Purposes

The Matthews line consists of complete equipment for independent power plants designed for home, marine, and industrial service. Three large and modernly equipped factories furnish facilities for reasonable deliveries. Matthews Light and Power Plants specially designed for homes are made in varying sizes to meet all such requirements from the small cottage to the large country estate. For marine use we furnish several models of various capacities and for industrial purposes—factories, carnivals, picture theaters, villages, summer camps, etc.—we make types that will exactly fit every need.



Model "H"—Marine Type Fifteen 20-Watt Lights, 32 Volts

FULL AUTOMATIC:

The Full Automatic feature of Matthews Light and Power Plants makes them practically self-operating. When the charge of the storage batteries falls below 15% of their maximum capacity, the plant automatically starts its engine and generator, which continue to run until the maximum charge is restored to the batteries, when engine and generator automatically stop

Batteries are protected against heating through overloading by the automatic starting of the engine and generator when the discharge rate reaches the danger point. When this occurs, the engine and generator are

automatically started and the generator takes the entire load. If both generator and batteries are needed, however, the batteries automatically are "cut in" again with load

and both carry the load GENERAL SPECIFICATIONS:

Matthews Engines—Marine type, long life, slow speed, water cooled, four cycle—bronze bearings.

Matthews Electric Governors—Control the battery charging rate under all conditions.

General Electric Company Generators—Recognized as the highest grade built.

Stewart Vacuum Systems—Supply fuel in unlimited quantities.

Stewart Vacuum Systems—Supply fuel in unlimited quantities.

Shebler Carburetors—Economical, efficient, and automatic—not mixing valves.

Willard Batteries—The finest grade manufactured and backed by thousands of service stations.

vice stations.

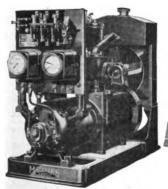
Lamp Protection—Counter E. M F. or end cells on 32 volt plants and double ended commutators on 110 volt plants maintain constant rated voltage on the lamps and prolong their life.

Capacity Rating—All Matthews plants are rated on the generator capacity only, therefore combined capacity of generator and battery will permit a 35% overload for 5 hours.

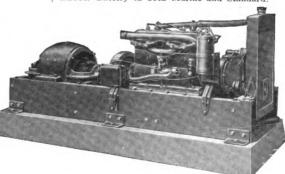
SIZE AND WEIGHT

	Floor Space	Hgh't	Net Weight	
Model H Standard	20x48"	30"	160 lbs	
Model H Marine	13x24"	18"	150 lbs	
Battery Glass Jar	56x18"	15"	450 lbs	
Battery Rubber Jar	15x20"	18"	280 lbs	
Model JR Standard	35x15"	31"	395 lbs	
Model JR Marine	15x30"	22"	390 lbs	
Battery Glass Jar	56x18"	15"	450 lbs	
Battery Rubber Jar	18x25"	18"	320 lbs	
Model E Standard	75x32"	42"	1700 lbs	
Model E Marine	72x32"	41"	1700 lbs	
Model E Rubber	60×60"	11"	1575 lbs	

On Model H and Model JR Standard, we furnish 80 Amp. Glass Jar Batteries, and with Marine types of these plants, a 72 Amp Rubber Jar Battery is furnished. On Model E, 127 Amp. Rubber Battery in both Marine and Standard.



Model "JR"—Standard Type Fifty 20-Watt Lights, 32 Volts



Model "E"—Both Standard and Marine Two Hundred Fifty 20-Watt Lights, 110 Volts

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ENGBERG'S ELECTRIC & MECHANICAL WORKS

No. 18 Vine St., ST. JOSEPH, MICHIGAN, U. S. A.

Manufacturers of Dynamos and Engines

ENGBERG ENGINES AND GENERATORS:

Are pre-eminent. They are positively a model of perfection-an ideal formulated after twenty years' experience-in designing, building and testing Engines Generators. For dependability, economy in steam and oil and low cost of maintenance, ENGBERG Direct Connected Generating Sets are a most remarkable piece of equipment.

We have produced the very best and the record of our machines and the growth 20 of our business verify this statement. It proves we have been most successful in the undertaking. It shows the design has been very carefully worked out on scientific hne modern engineering principles, and, furthermore, that the workmanship and materials cannot be excelled.

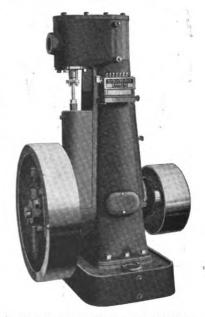
ENGBERG DIRECT CONNECTED GENERATING SETS:

Have been adopted as a standard by the most responsible concerns, because they give every service that any reasonable operator could expect. They are built up to an ideal-not down to price. The design has been formulated, not by one individual, but upon the advice and the co-operation of thousands of users.

Every detail has become a standard

strated its supreme excellence by continuous, efficient and satisfactory performance.

There is no doubt but that ENGBERG apparatus has more predominant, distinctive and serviceable features than any other similar equipment on the marketbarring none and regardless of price.



Vertical, Self-Oiling Engines I to 100 H. P.

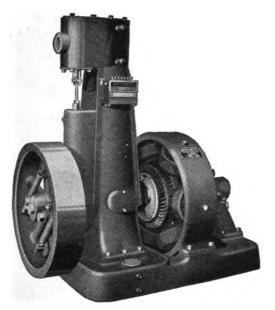
We invite careful inspection and investigation, because the general principles. as well as the smallest details, have never failed to attract the attention of the most critical buyer.

For Economy, Durability and Successthrough public approval and has demon- | ful Operation they are most acceptable.

ENGBERG'S ELECTRIC & MECHANICAL WORKS

No. 18 Vine St., ST. JOSEPH, MICHIGAN, U. S. A.

Manufacturers of Dynamos and Engines



Direct Connected Generating Sets I to 50 K. W.

SPECIFICATIONS AND DATA

Engine		No.			er Pipes	Code Word	Code Word		
Frame	K.W.	of Poles	of Engine	Pressure	per Minute	Steam	Exhaust	110–125 Volts	220-230 Volts
Ă Ā	1 1/2	4 4	3½x3½ 3½x3½	90 90	750 750	1 1	11/4	Bacaad Edcaad	Olgaad Rogaad
B B	$\frac{2\frac{1}{2}}{\frac{3\frac{1}{2}}{5}}$	4 4	3½x3½ 4½x4 4½x4	90 90 90	750 500 700	11/4	11/2	Fecaad Ihcaad Jicaad	Spgaad Urgaad Wtgaad
CC	6 71/2	4 4	6x5 6x5	90 90	400 500	11/2	2 2	Lkcaad Oucaad	Xugaad Yvgaad
0000	8 10 10 12½	6 6 6	6x6 6x6 7x6 7x6	90 90 90 90	375 450 350 425	2 2 2 2	2½ 2½ 2½ 2½ 2½	Pacaad Srcaad Tscaad Utcaad	Axgaad Bygaad Fakaad Hckaad
F	15 171⁄2	6	7x7 8x7	90 90	400 400	21/2 21/2	3	Vucaad Yxcaad	Idkaad Jekaad
GG	20 25	6	8x8 8x8	90	325 400	3	31/2	Azcaad Dagaad	Lgkaad Nikaad
Ī	25 30		9x9 10x9	90 90	325 300	3 3	31/2	Ebgaad Higaad	Ojkaad Sukaad
J	40 50	8 8	10x10 12x10	90 90	300 275	3	31/2	Ifgaad Ligaad	Upkaad Ytpaad

ALLIS-CHALMERS MFG. CO.

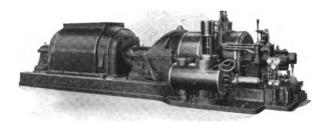
MILWAUKEE, WIS.

Sales Offices in All Principal Cities
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Str.ndard 4000 K. W. Steam Turbine and Alternator Unit



22

Complete Line of
ELECTRICAL MACHINERY
STEAM TURBINES
HYDRAULIC TURBINES
CENTRIFUGAL PUMPS
PUMPING ENGINES



Type "S" Centrifugal Pump Connected to Type
"A N" Motor



Allis-Chalmers Impulse Wheels: 48,000 H. P. Concentrated in Two Units, 2160 Foot Head, 375 R. P. M.

STEAM ENGINES, CORLISS TYPE
BLOWING ENGINES
OIL ENGINES, DIESEL TYPE
GAS ENGINES
AIR COMPRESSORS
CONDENSERS

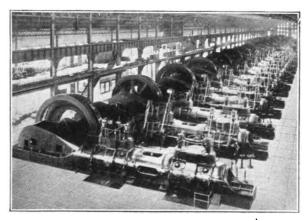


Allis-Chalmers Cross Compound Engine, Direct Connected to an Allis-Chalmers Generator



Five 500 K. V. A. Vertical Hydro-Electric Turbines

ALLIS-CHALMERS MFG. CO.



Power House, Illinois Steel Company, Gary, Indiana



FLOUR MILL MACHINERY SAW MILL MACHINERY TRANSMISSION MACHINERY PULLEYS, SHAFTING, ETC.

FARM TRACTORS





Allis-Chalmers Triplex Oil Engine, Direct Connected to Allis-Chalmers Plunger Pump

MINING AND CONCENTRATING MACHINERY

CRUSHING AND CEMENT
MACHINERY

Style "K"
Gates Rock
and
Ore Breaker



For Economy in operation use A-C Heavy Duty Crushing Rolls.



Allis-Chalmers "XX" Type Straight Line Crushing Rolls

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GENERAL ELECTRIC COMPANY

GENERAL OFFICE: SCHENECTADY, N. Y.

Manufacturers of Complete Electric Power Equipment and Supplies

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* Southwest General Electric Company.

For business outside of the United States address:

INTERNATIONAL GENERAL ELECTRIC COMPANY, INC.

New York, N. Y. 120 Broadway SCHENECTADY, N. Y.

LONDON 83 Cannon St.



The Guarantee of Excellence on Goods Electrical

TRADE-MARE

G-E PRODUCTS:

The products of the General Electric Company comprise practically every kind of apparatus and machinery used in the generation, transmission, distribution and use of electrical energy. It is entirely practicable, therefore, for the engineer to standardize with G-E equipment. The thousands of different G-E products are in use in all parts of the world.

WATER WHEEL DRIVEN GEN-ERATORS:



Vertical Shaft Water Wheel Driven Generator

The General Electric Company is producing generators for water wheel

drive in capacities ranging from 30 kv-a to 32,500 kv-a. G-E water wheel generators, totalling more than 3,000,000 kv-a capacity are in successful operation.

Both horizontal and vertical types are individually designed to meet most efficiently the various requirements composed by the water supply for any given development.

This company manufactures also all electrical apparatus necessary for the complete equipment of hydro-electric stations.

Bulletins 40600-A and 40601.

CURTIS STEAM TURBINES:



300 Kw. Curtis Steam Turbine Generator

The General Electric Company manufactures Curtis Steam Turbines which are admirably adapted for installation in electric generating stations and for supplying light and power in any industry.

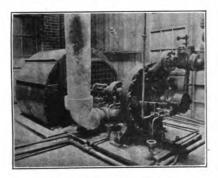
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GENERAL ELECTRIC COMPANY

Their operation is characterized by a minimum of vibration and noise. They are very compact, requiring minimum floor space, head room and attention. These turbines can be furnished for either condensing or non-condensing systems, high, low and mixed pressures, with dry or superheated steam.

Bulletins 42010 and 42201-A.

MECHANICAL DRIVE TURBINES:



Type "L" Curtis Steam Turbine Driving Forced Draft Blower, Norwich Gas & Electric Co., Norwich, Conn.

Type "L" Curtis Steam Turbines are suitable for driving fans, blowers, pumps, stokers, paper mill machinery, etc. The simplicity of design and the liberal factors of safety used in the construction of these turbines insure reliable and successful operation with a minimum of attention. This feature is of prime importance, as power plant auxiliaries are usually installed in inaccessible places where they receive little attention.

Bulletins 62010 to 62013.

TURBINE GENERATOR HEADLIGHT SETS:



Headlight Turbine Generator

This company manufactures also a 500-watt Curtis turbine generator set designed especially for locomotive headlight service, but which is used also for other applications, such as steam shovels, derricks, wrecking cranes, oil-well drilling outfits, launches and tug boats.

Bulletin 42014-A.

STEAM ENGINE DRIVEN GENERATING SETS:



Single Cylinder, Forced Lubrication Engine, with D. C. Generator

Steam engine generating sets are made for small plants, and for lighting construction operations in isolated places, requiring 60 kw. or less. These sets are designed to meet the severe conditions of marine work, which demand light, compact and durable sets of close regulation and quiet operation. They are used extensively for both power and lighting service.

Bulletin 42300.

BELT DRIVEN GENERATORS:



150 Kw., Belt Driven Alternator

A. C. belt-driven generators are designed for various frequencies, voltages and phases from 7½ to 550 kw. Belt-driven D. C. generators can be furnished in capacities from a fraction of a kilowatt to 300 kw. for standard voltages.

Bulletins 40010 and 40021.

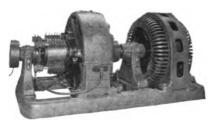
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GENERAL ELECTRIC COMPANY

SCHENECTADY, N. Y.

MOTOR GENERATOR SETS:



200 Kw. Motor Generator Set

G-E motor generator sets are built in sizes from 0.2 to 1500 kw. Large sets are used extensively in railway and mine service. Small sets up to 200 kw. are used for excitation purposes. A line of standard motor generators with single-phase, 60-cycle induction motor and shunt wound generators is used extensively for battery charging.

Bulletin 42552-A.

SYNCHRONOUS CONVERTERS:

G-E Synchronous Converters are used extensively by railroads, electric light and power plants, large industrial projects and for electrochemical operations. The Commutating Pole Synchronous Converter introduced by the General Electric Company has been so successful in operation that it is now practically a standard design for all the larger sizes. For low voltage, industrial and electrolytic work, the regulating pole or booster type is recommended.

The G-E Portable Synchronous Converter Substation, containing a converter, transformers, switchboard and accessories, is widely used in railroad work and in industrial plants where additional temporary power is desired.

Bulletin 42500.

OIL CIRCUIT BREAKERS:

The General Electric Company has on the market complete lines of oil circuit breakers to meet a great variety of

conditions. These lines comprise breakers for potentials up to 155,000 volts and above, and in current capacities up to 5,000 amperes. They are liberally designed and strong in construction, essentials for reliability and satisfactory operation.

AIR CIRCUIT BREAKERS:





Type CK-2

Type CK Double Pole

The satisfactory operation given in all kinds of railway, industrial and building service, is an indication of the quality of G-E air circuit breakers. These breakers are made in sizes from one to 20,000 amperes for circuits up to 650 volts A. C. and 3,600 volts D. C. Made for motor, float, solenoid or manual operation.

ELECTRICAL INSTRUMENTS:





Switchboard Type Curve Drawing Ammeter

Semi-flush Type Switchboard Voltmeter

The General Electric Company has developed and perfected a complete line of indicating and recording instruments for all classes of work. These are all of such mechanical excellence that they have become the standard for highest grade instruments.

For further information send for bulletin on the particular type:

D. C. Round Pattern Meters Bulletin 46017,

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GENERAL ELECTRIC COMPANY

A. C. Round Pattern Voltmeters, Bulletin Y 492. Horizontal Edgewise Meters, Bulletin 46016. Frequency and P. F. Indicators, Bulletin 46016. Synchronism Indicators, Bulletin 46015. Curve Drawing Meters, Bulletin 46021. D. C. Astatic Watthour Meters, Bulletin 66351. Portable Meters, Bulletin 48013, Section 100A.

G-E FLOW METERS:



G-E Indicating Flow Meter

G-E Indicating, Recording and Integrating Flow Meter

G-E Flow Meters provide a means of accurately measuring the flow of steam, water, air, gas or oil, through pipes or closed conduits, and so furnish information of great value in the economical management of any industry or central

The steam flow meter is adapted for measuring the amount of steam generated by a boiler plant or the amount used for heating, manufacturing purposes, etc. It can be used for equalizing the load on individual boiler of a battery or for dis-covering losses. The water meter is used to measure boiler feed water or input to water turbines, output of pumping plants,

They are built in several types for different classes of service.

Bulletin 46501-C.

TRANSFORMERS:

In G-E Transformers reliability has always been the first consideration. Those now in service, totalling many thousands of kv-a capacity, have proved their ability to operate continuously with minimum losses and maximum factor of safety.

G-E transformers may be broadly divided into two classes—oil insulated and air blast. The latter are limited to use with potentials that do not exceed 25,000 volts, while the former may be used for any voltage.



Distribution Trans-former for Pole Mounting

In addition to those for power and lighting circuits, this company makes transformers for special services, including electric welding, railway signal lighting, telephone line insulating, loom stop mechanisms, X-ray apparatus, etc.

Information concerning the above should be obtained from the nearest G-E

A. C. VARIABLE SPEED COMMUTA- 27 TOR MOTORS:

BTS, 3-phase, commutator motors give high efficiency at a great number of speeds. Speed changes, starting and stopping, are obtained by merely shifting the brushes. Motors developed for 60 cycles from 10 to 100 horse power. Slow speed 25-cycle motors can be furnished for 100, 125 and 150 horse power.

Type BSS, single phase, brush shifting motors are furnished in sizes from 1/4 to 7½ horse power, 1200 and 1800 R. P. M. 60 cycles.

Bulletin 61401.

A. C. VARIABLE SPEED HOIST **MOTORS:**

Type MTC Alternating Current, 3-Phase Motors, give maximum torque for a given weight. They are very strong mechanically and are used for hoist and similar service of an intermittent nature where the limiting feature depends upon the frequent starting and accelerating torque required. These motors are furnished in standard capacity from 1 to 300 horse power, 60, 40 and 25 cycles, with open frames and taper shafts on each end for gear and solenoid brake.

Bulletin 48119.1.

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GENERAL ELECTRIC COMPANY

SCHENECTADY, N. Y.

A. C. VARIABLE SPEED INDUCTION MOTORS:

Form MT Motors with phase wound rotor and external resistance are adapted for service requiring frequent starting under load or starting loads with high inertia. High starting torque is obtained with a comparatively small amount of current from the line. Standard ratings up to 200 h. p., 25, 40 and 60 cycles. Special rating up to 6,000 h. p.

Bulletin 41302.

High speed Form MT Induction Motors, ranging from 75 to 300 horse power, for direct connection, can also be furnished.

POLYPHASE CONSTANT AND MULTI-SPEED MOTORS:

Type KT Polyphase Induction Motors are made with riveted or skeleton frames, ranging from ½ to 750 horse power. Adaptable for driving all classes of machines requiring constant speed.

Bulletins 41302A and 41519.

High speed Type KT Induction Motors are especially adapted for centrifugal

pumps and similar service.

Multi-Speed Type KT Induction Motors are wound for 60-cycle, 3-phase service only. Furnished up to 12 h. p. at four constant speeds.

Constant horse power motors are suitable for machine tools, etc. Constant torque motors for operating fans, blowers, printing presses, etc.

SINGLE PHASE CONSTANT SPEED MOTORS:



Single Phase Constant Speed Motor

Type RI Constant Speed Single-Phase Induction Motors can be fur-

nished in sizes from 1/4 to 15 horse power, frequencies 25, 40 or 60 cycles.

Reversible RI Motors furnished in sizes 1/4 to 5 h. p., are especially useful for driving elevators, small cranes and hoists, laundry machinery, etc. Standard non-reversible Type RI motors may be made reversible with reduced rating by simply adding four leads and resetting brush yoke.

Bulletins 41507A and 61200.

SINGLE PHASE CONSTANT AND VARIABLE SPEED MOTORS:

Type HI Single Phase Motors, especially designed for mining service, have high starting effort and large capacity for severe overload. Built in standard sizes from 5 to 75 horse power, 3 phase, 60 cycles in different voltages, with or without back gear.

SYNCHRONOUS MOTORS:



Synchronous Motor Driving Air Compressor

While the synchronous motor may be applied to most any industrial service, its greatest value is obtained when used on circuits with a need for power factor correction, indicated as follows:

When the power factor is low and greater generator, transformer or feeder capacity is

when power is purchased at a rate which is now, or shortly may be, dependent upon the power factor of the load.

When the voltage regulation is poor on account of an existing induction motor load and production falls off in consequence.

When continuity of operation is imperative and dirty operating conditions make a small motor air gap inadvisable.

The General Electric Company has designed complete lines of synchronous

GENERAL ELECTRIC COMPANY

motors covering a wide range of speeds and capacities which are in extensive use throughout many industries, driving rolls, compressors, pumps, grinders, crushers, blowers, fans, conveyors, etc.

Bulletin 41309. Our engineers will be pleased to supply additional information on request.

A. C. AND D. C. MILL TYPE MOTORS:



D. C. Mill Type Motor

Types MI and MD Mill Type Motors embody special design for severe steel mill service. In addition to cranes and reversing auxiliary machinery in steel plants, these motors can be applied with advantage to ore and coal bridges and unloaders, charging machines of all types, heavy duty fabricating shop and erecting shop cranes, small heavy duty hoists, electric shovels, dipper dredges, canal locks, drawing and lift bridges,

Mill Type Motors are furnished totally enclosed, in sizes from 3 to 150 h. p., A. C. or D. C., and, with open frames, from 25 to 150 horse power, A. C.; and 30 to 210 horse power, D. C.

D. C. CONSTANT SPEED MOTORS:



15 H. P. Type RC Motor with Sliding Base and Pulley

Type RC Motor may be classed as a

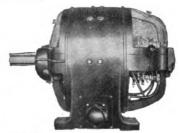
especially designed to meet the majority of conditions. It is furnished for constant speed, shunt wound for conditions requiring close speed regulation; compound wound for heavy starting torque or where violent power fluctuations occur, and series wound where loads either possess fixed values or may be made subject to automatic or manual control.

All Type RC Motors are shipped for floor installation but may be readily arranged for wall or ceiling suspension.

Ratings for open, semi-enclosed or enclosed self-ventilated types, or enclosed non-ventilated, from 1/2 to 200 h. p.

Bulletins 61014 and 41013.

D. C. ADJUSTABLE SPEED MOTORS:



Direct Current Adjustable Speed Motor

Type RF Adjustable Speed Commutating Pole Motors have been designed for machine tool and similar service where wide variation in adjustment of speed, independent of load, is required.

Made in sizes from 2 to 50 horse power, 230 volts, and 2 to 20 horse power, 550 volts. Speed adjustment by field, 2 to 1, 3 to 1, or 4 to 1.

Type RA Motors, sizes from ½ to 1½ h. p., 115 and 230 volts. Speed adjustment 2 to 1, or 3 to 1.

D. C. CRANE AND HOIST VARIABLE SPEED MOTORS:



D. C. Crane and Hoist Motor

CO 1800 Crane and Hoist Variable universal direct current motor as it is | Speed Motors are designed for inter-

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GENERAL ELECTRIC COMPANY

SCHENECTADY, N. Y.

mittent service, requiring a maximum torque motor of ample overload capacity. Enclosed reversible and series wound suitable for floor, wall or ceiling mounting. Furnished with or without back gear.

Sizes range from 2 h. p. to 100 h. p., 115, 230 and 550 volts. Electric brakes of half or full torque capacity can be supplied to insure a quick, positive stop.

Bulletin 68100-A.

FRACTIONAL HORSEPOWER MOTORS:

The General Electric Company has studied extensively the problem of electric motor application to small tools, etc., and, with its familiarity thus gained, is in a position to help other manufacturers who have small tool power application problems.

Fractional horse power motors are made in several types for A. C. or D. C., with ratings from 3/4 to 1/200 h. p., inclusive.

Bulletins 61509 to 61512.

MOTOR STARTING AND CONTROL:

An almost unlimited number of types of motor controlling devices are manufactured by the General Electric Company. Among them are motor starting and speed regulating rheostats, starting compensators for A. C. motors, automatic starting devices, remote control switches, drum controllers, etc.

Magnetic control for machine tool drive is both convenient and economical. The General Electric Company makes standard direct current equipment for constant and adjustable speeds, reversing and non-reversing.

AUTOMATIC SOLENOID BRAKES:



Automatic Solenoid Brake

G-E Automatic Solenoid Brakes, for both direct and alternating current,

render excellent service for automatic quick-stopping of rotating parts. They are made for motors of 1 h. p. and above, having equal braking torque in both directions of rotation.

Retarding torque is obtained at 1 ft. radius on the brake wheel shaft of not less than full torque of the motor on which it is used, and a maximum "holding torque at rest" at about 110% full load torque. Lesser degrees of braking may be obtained through adjustments, as many as 15 adjustments being possible in some cases.

Bulletin 48900.

INDUSTRIAL OIL CIRCUIT BREAKER:



Oil Circuit Breaker for Motor Circuits

The Type FP 10 Oil Circuit Breaker is particularly suitable for starting and controlling induction motors of 25 horse power or less, up to 600 volts and 50 amperes. Suitable for a variety of industrial services, either automatic or non-automatic, due to the numerous styles manufactured. Interchangeability of parts assures quick repairs.

Bulletin 47419-A.

THERMOSTATS:

The CR 2990 Thermostat is used for automatic control of motors according to temperature variation. It is used either as a master switch with an automatic starter or with an auxiliary relay. It is unaffected by vibration or moisture and is positive in operation under either alternating or direct current. Especially suitable for refrigerator work.

Bulletin 68500.

GENERAL ELECTRIC COMPANY

PRESSURE GOVERNORS:



Pressure Governor

For A. C. or D. C. Circuits

Recommended for use in the control circuit of any standard automatic starter to maintain a constant pressure between predetermined limits on any liquid or gas system.

A simply designed, compact instrument, with provision for adjusting the cutting in and cutting out pressures. Indicates pressure on system at all times. Bourdon tube made of non-corrodible alloy.

Instrument is shipped complete, drilled and tapped for connections and ready to mount in any convenient location.

Bulletin 68411.

SOLENOID OPERATED VALVES:



Electrically Operated Valve

For the remote or automatic control of liquids or gases under pressure. Suitable for operating steam or air whistles, controlling the application of brakes operated by compressed air or oil, such as are used on large hoists, controlling the flow of fuel fluids to furnaces, etc. These valves may be operated from a distance by means of a snap switch, float switch, thermostat or push button station. Coils for all commercial voltages and frequencies can be supplied.

FABROIL GEARS AND PINIONS:

Fabroil Gears are superior to other non-metallic gears by virtue of the measure of elasticity, which allows meshing teeth to come to a good bearing across the full width of the face and will absorb shock or rapid variation of torque.



Fabroil Gear

Because of their noiseless operation, long life and high-tooth strength, Fabroil gears are applicable to machine tools, textile mill machinery, printing machine mechanisms, automobiles, etc.

Bulletin 48703-A.

31

MOTOR DRIVEN EXHAUST FAN OUTFITS:





Riveted Frame Induction Motor, Direct Connected

Ventura Disk Fan with Direct Current Motor

G-E exhaust fan outfits are self-contained units adapted for ventilating or where it is desirable to remove steam, moist air, dust, smoke or obnoxious gases and fumes. Made in disk and propeller types with A. C. or D. C. motors for standard voltages. Sizes range from 12½ to 48 inches diameter, capacities from 750 to 25900 cu. ft. of air per minute.

Bulletin 41801.

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GENERAL ELECTRIC COMPANY

SCHENECTADY, N. Y.

CENTRIFUGAL COMPRESSORS:



Motor Driven Centrifugal Compressor

G-E centrifugal blowers or compressors are designed for large volumes and low pressures, such as are required for oil and gas burning furnaces, foundry cupola blowing, pneumatic conveying systems, agitating of liquids, etc.

These blowers are similar in design to the centrifugal pump. They are driven by D. C. or A. C. motors, or by Curtis steam turbines. Blower and driver are direct connected, requiring at most three bearings.

Standard single-stage and large multistage sets. Bulletins 48601 and 48609. Also small multi-stage sets.

Bulletin 42801.

PORTABLE AIR COMPRESSORS:



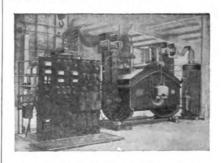
Portable Air Compressor

The small G-E reciprocating compressors, such as are used to supply air brakes on electric street cars, are particularly applicable for blowing out machinery in industrial plants. These are built with either induction motors or D. C. motors.

These compressors are furnished as either portable sets or stationary equipments, complete with automatic pressure governor, reservoir line switch, fuses and pressure gauge.

Bulletin 48610.

G-E ELECTRIC FURNACES:



G-E Metal Melting Furnace and Control

The G-E electric furnace for melting non-ferrous metals and alloys provides a clean, intense heat, well distributed and perfectly controlled. Its use has revolutionized the alloying of metals because electric heat can be brought to any temperature and kept there indefinitely. It even permits the use of several temperatures, in different parts of the furnace, under automatic control.

For heat treating processes requiring temperatures from 900 to 1800 degrees F., the General Electric Company has developed a type of electric heating unit which is adapted to either horizontal or vertical cylindrical furnaces.

Besides high temperature, electric heat treating furnace equipment, this company makes a small electric muffle furnace which meets the demand for a convenient, economical and durable furnace for heat treating carbon steel, baking vitreous enamel, experimental purposes, etc.

Heat treating problems should be referred to the industrial heating specialists located in the nearest G-E office.

GENERAL ELECTRIC COMPANY

OIL TEMPERING BATHS:

The G-E Oil Tempering Bath for tempering carbon steels is safe, efficient and easy to operate. It is made in different sizes, heats up very quickly and can be held at any temperature.

Bulletin 69700.

ELECTRIC SHERARDIZING MA-CHINES:

Electric heat is ideal for this method of rendering metal non-corrosive. Articles electrically sherardized may be bent, swaged or otherwise deformed at ordinary room temperature without injury to coating.

Bulletin 48926 gives other points regarding this process.

ELECTRIC RIVET HEATERS:



Electric Rivet Heater in Operation

Industrial progress has created a demand for an efficient, portable and self-contained rivet heater. The G-E electric rivet heater eliminates the expense of handling fuels, installation and maintenance of piping, and the problem of disposing of waste gases, cinders and dust, incident to the old heating methods.

Bulletin 69701.

ELECTRIC SOLDERING IRONS:

The electric Soldering Iron is efficient and convenient. For light or intermittent work it is one of the most useful of the electrically heated devices for industrial purposes.



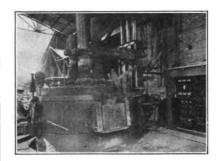
Electric Soldering Iron

The soldering irons manufactured by the General Electric Company have been on the market for a number of years and have given general satisfaction. Made in various sizes. Bulletin B-2571.

various sizes. Bulletin B-3571.

G-E electric heating units are applied also to electric soldering iron furnaces, metal melting pots, glue pots, cartridge heating units and industrial kettles.

ARC FURNACE EQUIPMENT:



Arc Furnace Electrically Controlled

The General Electric Company can supply all the electrical equipment needed in connection with any type of electrical arc furnace.

The company is constantly developing new types of equipment necessitated by the rapid advance going on in the utilization of electrical heat in industrial operations.

Designers of furnaces for reduction of ores, for production of abrasives, ferroalloys, steel, calcium carbide, etc.; electrolysis of fused salts, fused silica products, carbon bisulphide, fixation of atmospheric nitrogen, and a multitude of other electrothermic developments will find the General Electric Company's experience in this line of value.

For the correct design of an electric furnace, chemical, metallurgical and electrical knowledge of specialized nature is needed. The General Electric Company retains furnace experts who will be pleased to coöperate with you in solving the electrical requirements of your problem.

Bulletin 48710-A.

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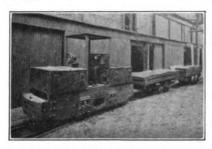
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GENERAL ELECTRIC COMPANY

SCHENECTADY, N. Y.

INDUSTRIAL ELECTRIC LOCOMOTIVES:



Storage Battery Locomotive, American Sheet and Tin Plate Co.

The electric locomotive is admirably adapted to fulfill the transportation requirements of all industries and possesses many advantages over steam locomotives, animal haulage, hand trucks, etc. Its advantages are:

Consumes power only when in actual operation. Can be operated by one man of ordinary intelligence. Ready for use at all times. Has large momentary overload capacity. Possesses an easy and perfect system of control. Has comparatively few wearing parts and consequently low maintenance cost. Requires attention only when actually in use. Can be run inside a building and in other localities where smoke and fire risk of a steam locomotive forbid its use. The interfactory transportation of large manufacturing plants that consist of buildings scattered over considerable areas, can be most satisfactorily and economically handled by small electric locomotives. It is equally well adapted for service in brickyards, stone quarries, cement plants, etc., in getting ore from mines to stamp mills, hauling log trains to saw mill, in large public works and in tunnel driving.

G-E industrial locomotives are of the single or double truck type with one motor mounted on each axle and vary in weight from 4 to 50 or more tons. They are built for gauges varying from 18" up to 56½". Storage battery locomotive motor equipments are designed to operate from 85, 170 or 200 volts—storage batteries. Equipments for the trolley and third rail type are designed for operation from 250, 500 and 600 volt D. C. circuits.

Descriptive publications covering various types of locomotives will be mailed upon request.

ARC WELDING APPARATUS:

The General Electric Company has developed four principal types of arc welding equipment—designed to meet almost every condition where it is possible to join metals by means of the electric arc. These equipments are as follows:

Constant Energy Generator which may be driven by any standard form of power apparatus, and which has such inherent characteristics that it automatically reduces the open circuit or "striking" voltage to the proper welding voltage when the arc is established.

Constant Potential Generator which may be driven by any standard form of power apparatus, and which generates a constant potential at all loads. The characteristics of this generator permit one or more welding circuits to be operated simultaneously without interference with each other.

Automatic Arc Welder, which may be used with either of the above types of equipment, or operated from any constant potential, direct current source of power.

Resistor Type of welding equipment consisting of a light weight portable resistor.

Send for Bulletin 48932-A.

CONSTANT ENERGY SETS:

These generators—known as Type WD—are primarily single operator units, designed for metallic electrode welding only, but may be used intermittently for carbon electrode welding provided the arc voltage does not exceed 35, and the current does not exceed approximately 50% of rating. The generator is so designed that it normally gives a no-load or "striking" voltage of 60, which, when the arc is established, automatically decreases to the required arc voltage—normally 18 to 20 volts. This characteristic entails a great saving in energy and materially assists the operator in making a successful weld.

GENERAL ELECTRIC COMPANY



Portable A. C. Motor Driven, Single Operator, Constant Energy Arc Welding Set

Balancer sets of the constant energy type are also designed with the same characteristics as the Type WD sets. This equipment is suitable for operation only when direct current at a potential of 110 to 125 volts is available.

CONSTANT POTENTIAL SETS:

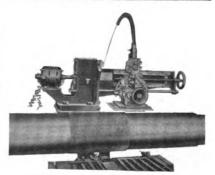


Portable Two-Operator Constant Potential
Arc Welding Set

These generators are built in ampere capacities of 400, 500 and 600 at 60 volts, and in ampere capacities of 800, 1000 and 1250 at 75 volts. These generators may be furnished for drive by any suitable electric motor, engine or belt. They deliver a constant potential over the entire range of no-load to full-load. One or more operator panels may be supplied with each equipment to meet the service requirements.

AUTOMATIC WELDER:

This equipment is a mechanical device to automatically feed a metallic electrode to the work, and maintain a constant arc length and constant welding temperature. It is for use on direct current circuits only. It may be operated from any of the constant energy or constant potential generators above mentioned, or from any constant potential direct current source of power.



Automatic Arc Welder Building Up Undersized Shaft

As an automatic welder can operate continuously for hours at a time, and during this period maintains a constant arc length, and therefore constant welding heat, it will make a more uniform, more successful, and more rapid weld than can be accomplished by any manual means.

This machine is particularly adaptable to building up worn or undersigned shafting, and welding seams of tanks or barrels. For further details ask for copy of publication.

Booklet B-3561.

RESISTOR TYPE OF WELDING EQUIPMENT:

These sets consist primarily of a resistance with suitable voltage and current taps, so that it may be connected directly to any direct current circuit of a potential of 600 volts or less, and deliver the proper welding voltage. The largest size is readily portable by two men—the smaller sizes by one man. It is designed primarily for use on electric railway lines, where it is not convenient or practicable to operate the more efficient welding generators.

ACCESSORIES:

Electrode holders for metallic electrodes, electrode holders for carbon electrodes, extra flexible cable for attaching to electrode holders, face masks and head shields may also be supplied on short notice.

DE LAVAL STEAM TURBINE COMPANY

TRENTON, N. J.

Builders of Steam Turbines, Double-Helical Speed-Reducing Gears, Centrifugal Pumps, Centrifugal Blowers and Compressors, and Special Centrifugal Machinery

The De Laval Steam Turbine Co, has built high-grade steam turbines and double-helical speed-reducing gears for over 25 years. Designs and special manufacturing methods have



De Laval Turbine-Driven Multi-Stage Compressor; 14,850 Cu. Ft. per Min. from 10 In. Water Column Vacuum to 8 Lb. per Sq. In. Gage; 615 H. P.

been developed, which, with the use of high grade materials and a thoroughgoing system of inspection and testing, insure satisfactory performance in service. All machines are built to limit gages on an interchangeable basis. Each unit is guaranteed as to efficiency, capacity and other characteristics, and is fully tested at the shop.

DE LAVAL STEAM TURBINES are of the single-stage, velocity-stage and pressure-stage types, and are built for all steam and exhaust conditions, and in all capacities up to 15,000 h. p.

DE LAVAL CENTRIFUGAL BLOWERS AND COMPRESSORS are built in all capacities and for all pressures up to 125 lb. per sq. in., for both motor- and steam-turbine drive. Close regulation for either constant pressure or constant volume is secured by sensitive, but simple and rugged, governors.

THE DE LAVAL DOUBLE-HELICAL SPEED-REDUCING GEAR was originally designed for steam turbine service, and has been perfected and fully tested by extensive use, both on land and at sea. Over 2,000,000 h. p. of De Laval gears are now giving wholly satisfactory service. De Laval centrifugal pumps driven by De Laval geared turbines in water works service are realizing over-all economics greatly superior to those of triple-expansion pumping engines. De Laval geared turbines are giving highly satisfactory and efficient service in driving



Direct-Current Generator Driven by De Laval Geared Steam Turbine; 1200 Kw.

DE LAVAL

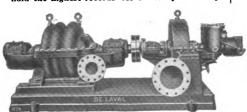
De Laval Geared-Turbine-Driven Centrifugal Circulating Pump

DE LAVAL CENTRIFUGAL PUMPS are built for all capacities and pressures, from boiler feeders to geared-turbine-driven water works pumping units, and for all methods of driving, including electric motors and directly-connected and geared steam turbines. De Laval pumps hold the highest records for efficiency and duty.

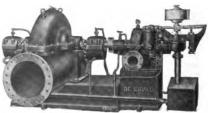
rolling mills and other slow-speed machinery, and in rope and belt drives. Standard-speed, direct-current generators driven by De Laval geared turbines are the most efficient means for supplying direct current. The De Laval gear is free from noise and vibration in operation, and shows an efficiency above 98%. Speed ratios up to 20 to 1 can be secured in one reduction.

State the conditions of service, so that specialized literature may be sent and so that our Engineering Department can supply full data and make suggestions for the best solution of power, pumping and air-compressing problems.





De Laval Steam-Turbine-Driven Centrifugal Boiler Feed Pump; 800 Gal. per Min., against 520 Ft. Head



De Laval Turbine-Driven Single-Stage Gas Blower; 11,000 Cu. Ft. per Min., against 33 In. Water Column

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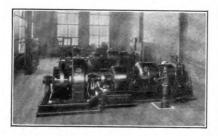
KERR TURBINE COMPANY

WELLSVILLE, N. Y.

Offices in All Large Cities

Manufacturers of Kerr Economy Steam Turbines and Reduction Gears

KERR ECONOMY STEAM TURBINES:



500 Kw. and 750 Kw. Kerr "Economy" Bleeder Type D. C. Turbine-Generators, Niles-Bement-Pond Co., Plainfield, N. J.

Made in the following types: Velocity stage, multi-pressure stage or combination velocity multi-pressure stage. Our flexibility of design and construction permits of economical operation on any combination of initial and exhaust pressures, without special design or excessive cost. A sufficient number of stages can always be offered to insure good economy with low steam velocities and consequent absence of bucket erosion, resulting in exceptionally low interest and depreciation charges.



Small Kerr "Economy" Direct Current Turbo-Generator Set

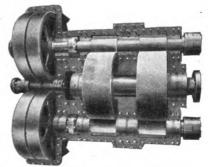
Kerr Economy Steam Turbines can be offered for operation under any of the following conditions:

High pressure condensing. High pressure non-condensing.

High pressure condensing permitting of automatic steam extraction.

Low, or mixed pressure.

KERR **ECONOMY** REDUCTION GEARS:



Overhead View of 3000 H. P. Double Reduction Marine Gear, 3600-90 R. P. M.

Cut on the most accurate gear hobbing machines obtainable. A wide range of sizes insures the same flexibility that is the salient feature of Kerr Economy Turbines.

KERR **ECONOMY** PROPULSION MARINE TURBINES:

Made in the combination velocity multipressure stage type. The turbine proper may contain a single rotating element, or may contain two rotating elements, a high pressure and a low pressure, forming what is known as the cross compound type. The speed of the turbine is reduced to the speed at which the propeller operates by means of a set of Kerr Economy Reduction Gears. These gears may be furnished for either single or double reduction, as desired by the Purchaser.

Our smaller turbines are especially well suited for driving marine type generators, pumps and blowers. Our numerous installations have proven their thor- ENGINEERING ough reliability.



MOORE STEAM TURBINE CORP'N

WELLSVILLE, NEW YORK

DISTRICT OFFICES

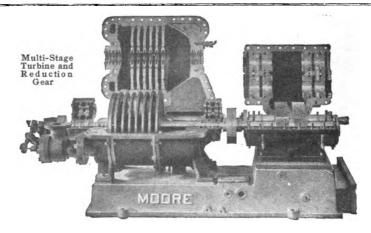
NEW YORK CHICAGO

BIRMINGHAM CLEVELAND

BOSTON SEATTLE SAN FRANCISCO

PITTSBURGH PHILADELPHIA St. Louis ST. PAUL

Manufacturers of Single- and Multi-Stage Steam Turbines, Condensing and Non-Condensing



38

TURBINE DRIVE ADVANTAGES:

Steam turbines possess many advantages over the reciprocating steam engine. Simplicity of design and operation favors the turbine. The turbine motion is continuously rotary-not a conversion of reciprocating motion to a rotary one with an attending loss of energy and wear of parts. The turbine also saves in oil and waste. Floor space is another point in support of the choice of a turbine.

THE MOORE STEAM TURBINE:

A steam turbine designed upon the sturdy basis of sound theory and practice by men of long and tested experience means a dependable, efficient prime mover. Moore Steam Turbines are dependable and efficient in principle and operation.

The most efficient type of steam turbine is known as the combination type, that is one type of turbine for the high pressure part of the expansion, combined with another type for the low pressure stages. Moore Steam Turbines are built on this plan.

Types: Moore Steam Turbines are made single- and multi-stage condensing and non-condensing types.

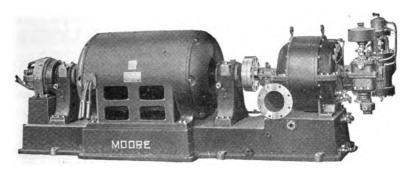
The single-stage type is the simpler form designed for small units. Moore turbines are designed for low speeds, so as to minimize gear troubles and lower rotation stresses. "Turbine Explosions" are designed out of the Moore Steam Turbine.

The multi-stage type consists of a single velocity stage with two or more single pressure stages.

All our turbines are manufactured on the quantity production basis, thus lowering their cost and at the same time producing precision parts for stock and assembly rooms. Thus stock parts are always on hand and always fit.

Sizes: Our turbines are built ENGINEERING in sizes from 5 to 1000 H. P.

MOORE STEAM TURBINE CORP'N



Direct Connected Alternator Units up to 500 KW. Non-Condensing. Direct Connected Alternator Units up to 750 KW. Condensing. Oil Relay Governor. Forced Feed Lubrication

CONSTRUCTION:

The Turbine Casings and Diaphragms are permanently joined and the combination is split horizontally. The two, as a unit, may be removed, for inspection.

The Rotor is a single velocity stage wheel carrying two or three rows of moving buckets, followed by two or more steel pressure stage wheels, all mounted on the same steel shaft. The first stage wheel is of solid forged construction.

The Buckets are of steel, perfectly smooth, and are removable for renewal.

The Nozzles: First Stage are cast bronze; diverging, expanding type. Second and following Stages are sheet metal strips cast into diaphragms.

Reversing Vanes are used between the rows of moving buckets of the first stage wheel.

Bearings: High speed service; ring or forced lubrication, or both; size and operating conditions governing.

Adjustable thrust bearings are provided.

Coupling: Latest improved flexible type.

Oil relay or direct connected type.

Governors: Are used depending on size of turbine and service.

Carbon Packing is provided, brass shrouded for protection. Packing will not cut shaft; steam-tight when properly fitted.

Gearing: Moore Double Helical Reduction Gears are solid forgings or carbon seler rings shrunk on C. I. centers. The Pinions are chrome nickel or chrome vanadium steel forgings. Heavy babbitted Bearings with forced lubrication.

POINTS OF SUPERIORITY:

1. High efficiency. Through using a velocity stage wheel followed by single pressure stages.

2. Low steam velocity. Due to multi-staging.

3. Accessibility. All sizes designed

with horizontally-split casing.
4. Emergency Governor. On all tur-

5. Carbon packing. Protected against breakage.

6. Moderate speeds.

7. Improved method of attaching Diaphragms.

8. Smooth Buckets with perfect alignment.

WE ARE PREPARED TO QUOTE ON:

Condensing and non-condensing singleand multi-stage steam turbines—5 to 1000 H. P.

Bleeder Turbines—Mixed Pressure Turbines.

Double Helical Reduction Gears.

Turbo Alternator Units. Geared and Direct Connected Turbo-Generator Units, Turbo Blowers, and Turbo Pumps.

Geared Belted Turbines.

Consult our engineers, always at your service. They give their advice and make recommendations, without placing you under any obligations.

| MECHANICAL | MECHAN

Send for Bulletin No. 24.

THE TERRY STEAM TURBINE CO.

MAIN OFFICE AND WORKS, HARTFORD, CONN., U. S. A.

BRANCH OFFICES

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PRODUCTS:

Steam Turbines, I to 1,000 H. P., condensing or non-condensing.

Centrifugal Turbo-Pump Sets for all classes of service.

Turbo-Generator Sets, D. C. or A. C., direct connected or through Terry Reduction Gears.

Duplex Exciters.

Turbo-Blowers for forced or induced draft.

Reduction Gears, combined Turbo-Gear Units.

TERRY STEAM TURBINES:

Principle of Operation: The outstanding feature which makes the Terry Turbine so simple and reliable is its principle of operation. Steam issuing from an expanding nozzle at high velocity enters the bucket of the single Terry wheel in which its direction is reversed 180°. As this single impact uses but a portion of the available energy, the steam is caught by a reversing chamber and returned again and again to the same wheel until all of the available energy is utilized. This principle of operation permits using but one wheel, which is made from a solid forging with buckets milled out of the solid metal. Fine blade clearance is not necessary (½° or more) and lateral clearance is very large (over 1°).

DUPLEX EXCITERS consist of an exciter generator driven at one end by a motor and from the other end by a specially governed Terry Turbine so arranged that should anything happen to interrupt the current to the motor, or should the motor fail, the Terry Turbine will immediately take the entire load. This unit offers many advantages of safety and overall plant efficiency.

TURBO BLOWER UNITS for forced and induced draft service, either geared



Fig. 1. INDE-STRUCTIBLE WHEEL OF TERRY TURBINE

Buckets cut from the solid and protected from rubing by raised wheel rim. Notch at center of blade reduces blade weight and stresses. Wheel can not burst and injure operators



Fig. 2. TERRY DUPLEX EXCITER UNIT
Insures continuous excitation, and is used extensively because
of reliability and adaptability to automatic heat balance

THE TERRY STEAM TURBINE CO.

or direct connected. depending upon draft requirements. This turbine drive obviates the objectionably large fans necessary with engine drive because of the low speed required by the engine for reliable service.

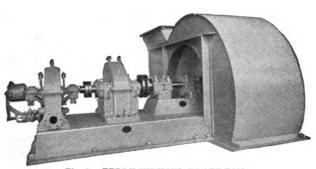


Fig. 3. TERRY INDUCED DRAFT FAN Small space and light foundations make it readily adaptable to plant inditions. Its high speed avoids the necessity of large bulky fans

TURBO GENERATOR UNITS are fur- | ing, manufacturing or other purpose. nished in sizes from 1 to 750 K. W.,

CENTRIFUGAL TURBO PUMP UNITS

Fig. 4. TERRY TURBO-GENERATOR SET D. C. units geared to permit high turbine speed and efficiency and low generator speed for good operating characteristics

geared or direct connected, condensing or non-condensing, used extensively for

main units in small plants or auxiliary sets for night lighting, week-end service, marine work, lifting magnets, etc., in large plants. In non-condensing work the turbine may be designed to exhaust against almost any back pressure desired for heat-

adapted classes of service including boiler feed, condenser circulation. hotwell. dredging. fire service. vacuum, water works and general service.

EXPERIENCE gained in over 7500 installations insures the purchaser against faulty workman-

ship, material or design. Write or 'phone the nearest district office.



Fig. 5. TERRY CONDENSER CIRCULATING SET Note the rugged appearance, compactness and simplicity. Where high efficiency is required, a Terry geared unit is used

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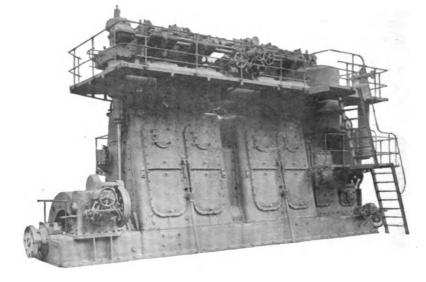
BUSCH-SULZER BROS.-DIESEL ENGINE COMPANY

EASTERN SALES OFFICE 30 Church St. NEW YORK MAIN OFFICE AND WORKS ST. LOUIS, MO.

WESTERN SALES OFFICE Rialto Bldg. SAN FRANCISCO

Designers and Builders of Diesel Engines since 1898

Owners of all DIESEL ENGINE Rights and Experiences, in and for the U. S. A. and its possessions, Canada and Panama, of the Diesel Motor Company of America, the American Diesel Engine Company, Sulzer Bros. (of Winterthur, Switzerland) and Rudolf Diesel (inventor of the engine).



Type "C" Two Cycle Busch-Sulzer Diesel Engine

STATIONARY ENGINES:

Vertical

42

Type "B" four cylinder, four cycle.

In the following standard sizes: 120, 165, 250, 365 and 520 B. H. P.

Type "C" four and six cylinder, two cycle. In sizes from 750 to 3300 B. H. P.

MARINE ENGINES:

Vertical

Type "CM" four and six cylinder, two cycle.

Directly reversible for coupling to the propeller shaft.

In sizes from 550 to 3300 S. H. P.

Special Light Weight, high-speed "Sub-marine" type Diesel Engines.

McINTOSH & SEYMOUR CORPORATION

MAIN OFFICE AND WORKS

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Builders of Stationary and Marine Diesel Type Oil Engines



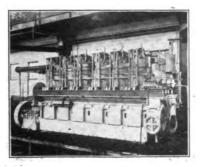
MOTORSHIP "BOOBYALA"

Equipped with a Pair of Our 640 I. H. P. Heavy Duty Diesel Type Marine Engines.

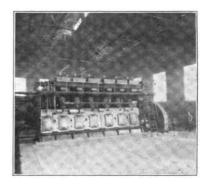
SIZES AVAILABLE.

I. H. P.	R. P. M.
390	265
640	190
960	135
1200	140
1300	138
1550	115
2000	105

All Four Cycle, Six Cylinder and Directly Reversible.



ONE OF THE 640 I. H. P. ENGINES IN THE MOTORSHIP "BOOBYALA"



1000 B. H. P. STATIONARY ENGINE

The above is the Power Plant of a modern Cement Mill and contains four 43 1000 B. H. P. units. A fifth unit is now on order.

We have engines of these types available in sizes from 100 B. H. P. to 1600 B. H. P.

The Central Station shown below has been in operation four years on twenty-four hour service and is now feeding into the main transmission system.

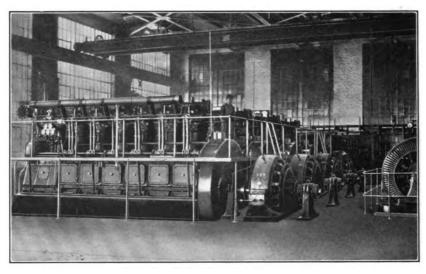


CENTRAL STATION WITH THREE 500 B. H. P. ENGINES

NEW LONDON SHIP & ENGINE CO.

GROTON, CONN., U. S. A.

Manufacturers of Stationary and Marine Diesel Engines



Nelseco Power Plant Consisting of 4-360 B. H. P. Four-Cycle Stationary Diesel Engines

NELSECO DIESEL ENGINES:



Burn cheap crude or fuel oil. At full power the fuel consumption is very moderate, using less than one-half pound per horse power hour.

"Nelseco" engines operate on the full Diesel principle and are ready for instant starting. No electric, hot-bulb or other ignition device is used.

They are simple in design, of rugged construction and easy to operate. Reliable service is furnished at a low upkeep cost.

Over 100,000 H. P. in Service

and

Over 50,000 H. P. Building

Or on Order.

Winner of the highest award—Gold Medal of Honor—at the Panama-Pacific Exposition.

Not only endorsed but extensively used by the United States and Foreign Governments.

DE LA VERGNE MACHINE COMPANY

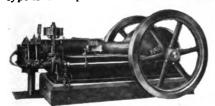
1123 EAST 138TH ST., NEW YORK CITY

Manufacturers of Oil Engines for Stationary and Marine Service Also Refrigerating and Ice Making Machinery

Sizes range from 25 to 1080 H. P. per unit. All engines designed to operate on practically any petroleum oil obtainable in the U. S. or Mexico.

TYPE "DH:"

Range of sizes 40 to 130 H. P. This type is an improvement over former and



well-known Hornsby-Akroyd Oil Engine. Operates at slow speeds, on the four-stroke design; in fact, the only four-stroke cycle small Crude Oil Engine of horizontal design obtainable in this country. Engine extremely simple and reliable. Running at rated capacities requires less than .50 lb. of oil per B. H. P. hour. Logical prime mover for small Pipe Line Pumping units and auxiliaries—Municipal Power Plants and small Isolated Industrial Plants of all kinds where petroleum oil is readily procurable.

TYPE "FH:"

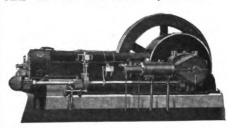
Range of sizes 100 to 280 H. P. per unit, in horizontal cylinder arrangement of one and two. Operates at low speeds. Employs medium com-



pression and functions on the four-stroke cycle Wide and long experience of many users conclusively proves this Engine best Oil Engine for operation on Mexican or other crude oils having a high percentage asphaltic base. This is due to use of carefully designed combustion chamber, atomizer and correct compression. Engine suited for Pipe Line Pumping units, Electric Generator sets in Lighting and Power Plants, Irrigation service and Industrial drives. It is simple and extremely reliable and hence pre-eminently well suited for production of power at a low cost where petroleum oil is readily procurable. Takes less than .5 lb. per B. H. P. hour when engine is loaded near rating.

DE LA VERGNE-DIESEL:

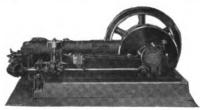
Range of sizes 180 and up in horizontal cylinder arrangements of one to six. Operates at low speeds and obtains extremely high fuel economy. Engine runs on the four-stroke cycle. This



Engine is direct result of an Oil Engine manufacturing experience of over 25 years, and as in the case of the before-mentioned Engines, particular attention has been paid in its development to such design features as lead to great simplicity of all parts. Engine extremely reliable, durable and economical. Logical prime mover for the larger Power Plants where the Oil Engine is applicable.

TYPE "SI:"

The latest development offered for stationary practice in horizontal 1 and 2 cylinder arrangements. Will operate on wide range of petroleum oils. Engine obtains Diesel economy without use of



air compressor and attendant mechanism or needle spray valve. This has eliminated many parts and furthered production of engine of maximum simplicity. All Engines, this type, may be started from stone cold and put under load in fraction of a minute. Operating at rating capacities these Engines will produce power at .45 lb. MECHANICAL ENGINEERING

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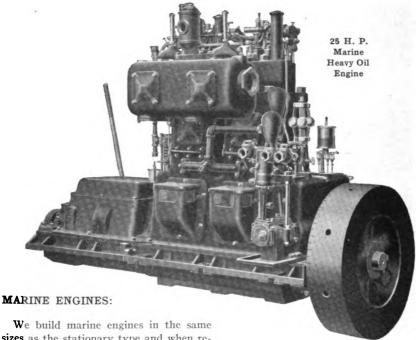
HEAVY OIL ENGINE DIVISION

· Distributor of the products of

DODGE MFG. CO., MISHAWAKA, INDIANA

15 Branch Warehouses in the United States.

Dealers in Every Representative City



We build marine engines in the same sizes as the stationary type and when required can furnish engine and propeller equipment complete for any class of heavy duty marine service, as well as auxiliary generator sets, winches, pumps, etc. Some of the outstanding characteristics of the Dodge Heavy Oil Engine which make it peculiarly adapted to marine service are reliability in starting and running, economy in fuel and operating cost, low maintenance cost, simpli-

city and wide speed range. In operation, a speed range of from 180 to 450 R. P. M. enables the operator to maneuver the boat in fishing, towing or docking from the pilot house. This engine starts immediately without preliminary heating on low pressure air (No. 250). No electrical heating or igniting devices, and no torches or high pressure air supply are required.

MARINE ENGINE SPECIFICATIONS

	No. Cyls.	R.P.M.	Net Wt. Lbs.	Domestic Crating Weight Lbs.	WEIGHTS AND MEASUREMENTS Approximate Boxed for Export	
Size					Gross Wt. Lbs.	Cubic Measurements Cu. Ft.
12½ B. H. P	1	425	3800	4200	4800	130
25 B. H. P	2	425	4800	5200	5900	150
37½ B. H. P	3	425	6200	6700	7400	175
50 B. H. P	4	425	7400	7900	9000	200
75 B. H. P	6	425	9700	10400	11500	250
Exhaust Silencer	١		500	600	700	20
Fuel Service Filter Tank	١	١	35	60	100	6

DODGE SALES & ENGINEERING CO.

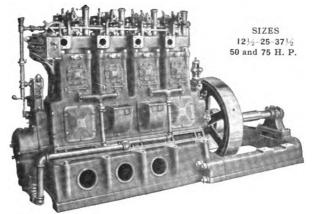
HEAVY OIL ENGINE DIVISION

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50 H. P. Stationary Engine and Special Sub-Base for Direct Connected Generator Set

As a reliable and economical prime mover, the Diesel heavy oil engine in the larger units has met in a satisfactory manner the requirements of a large number of users both in this country and abroad. Due to the increasing demand for engines with similar characteristics in the smaller sizes, we have developed an improvement on the Diesel principle which has enabled us to meet successfully this demand, and we are now supplying these engines to a rapidly increasing number of discriminating users who desire nothing but the best in point of reliability, service and economy of operation. These engines are manufactured with the same painstaking attention to detail which has characterized the DOGE products for over forty years, and are sold under a standard guarantee to render satisfactory service, using not to exceed .5 lb. of 28° Baume fuel oil per B. H. P. Hr. in the sizes covered under specifications below in both marine and stationary types.

The four cycle principle has been found to be the most reliable for all classes of service and is the most widely known, and for this reason is used in all DOGE Heavy Oil Engines. Only one cylinder size (12½ B. H. P.) is used and the larger engines are built in multiples of this size cylinder. The greater number of parts used in these engines are therefore interchangeable, and standard to all sizes. We are prepared to furnish complete power plants under one contract within the range of sizes given, either direct connected or belt driven, for almost every class of stationary or marine requirements, and to furnish reliable experienced engineering service to any one contemplating the installation of internal combustion engines.

STATIONARY ENGINE SPECIFICATIONS

	No. Cyls.	R.P.M.	Net Wt. Lbs.	Domestic Crating Shipping Weight Lbs.	Approximate WEIGHTS AND MEASUREMENTS Boxed for Export		
Size					Gross Wt.	Cubic Measurements Cu. Ft.	
12½ B. H. P. 25 B. H. P. 37½ B. H. P. 50 B. H. P. 75 B. H. P. Rahaust Silencer	2 3	425 425 425 425 425	3000 4000 5100 6200 8400 500	3400 4400 5600 6700 9100 600	3900 5000 6200 7500 10000 700	90 110 130 150 190 20	
Fuel Service Filter Tank			35	35	100	1 0	

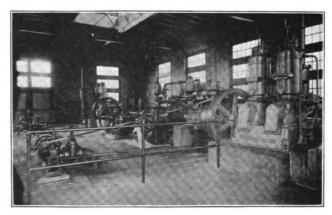
(See pages 350-351 for additional products of this Company)

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FAIRBANKS, MORSE & CO.

CHICAGO, ILL.

Manufacturers of Motors, Engines, Oil and Kerosene; Pumps, Steam, Power, Centrifugal; Generators, Alternators, Starters, Etc.; also Scales, All Kinds; Railway Supplies, Motor Cars, Standpipes, Coaling Stations, Etc.; Water Systems; Tanks and Towers; Hoists, Air Compressors, Etc.



This Installation Shows Two "Y" Oil Engines Direct-Connected to Duplex Power Pumps and Belted to Centrifugal Pumps

48 "Y" OIL ENGINES:

10 H. P. to 200 H. P.

Fairbanks-Morse "Y" Oil Engines 10 H. P. to 200 H. P. have set a new standard of low power costs through efficient use of low priced fuel oils. Simple in construction—practically automatic in operation and regulation—no carburetors, valves, batteries, mixers, timers, igniters, magnetos, switches or spark plugs. Special quick-starting device; air seal prevents oil from being blown out of bearings; positive lubrication; sensitive governor. No hot bulb—no water injection.

PUMPS:

Steam, Power, Centrifugal.

Fairbanks-Morse Pumps are made in all types and sizes for use in practically every industrial, producing, and manufacturing field. A long successful service record is being maintained by thousands of installations. Write for bulletin describing the types you are interested in.

MOTORS A. C. AND D. C.—GENERATORS:



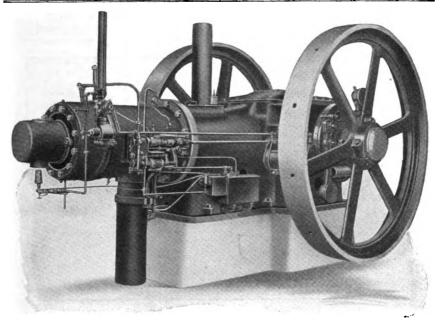
Fairbanks, Morse & Co. are the pioneer manufacturers of ball-bearing motors. We also make sleeve and ring bearing types—A. C. and D. C. and generators and alternators in a large variety of sizes.

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MUNCIE OIL ENGINE COMPANY

500 AMERICAN BLVD., MUNCIE, INDIANA, U. S. A.

Manufacturers of Muncie Oil Engines



R. H. View 100 H. P. Type C Heavy Duty Design

THE MUNCIE OIL ENGINE:

Single Cylinder Heavy Duty Crude and Fuel Oil Engines of Medium Compression and Low Speed. Built in sizes 10 to 125 Horse Power.

Equipped with Automatic Governor for regulation within two per cent with varying or intermittent loads. On changing loads this close and positive regulation produces an ideal steadiness.

Made in standard types Belted with Friction Clutch Pulley, Direct Coupled with Friction Cut-off Coupling and special Electric Types.

These engines use any fuel oil from kerosene or gas oil to 18° Baumé crude, but

operate ideally, most economically and efficiently on 24° to 28° Baumé Gravity Fuel Oils. The fuel consumption with engine loaded at full rating is but sixtenths ($^{6}/_{10}$) of a pound per B. H. P. hour.

Muncie engines are of generous design, sturdy construction, built to withstand the most severe service.

OVER 80,000 H. P. IN USE

Special bulletins are issued on the various types and sizes. Write for complete catalogue and specifications today.

Tell us your power problems. Let us make suggestions for your convenience and profit.

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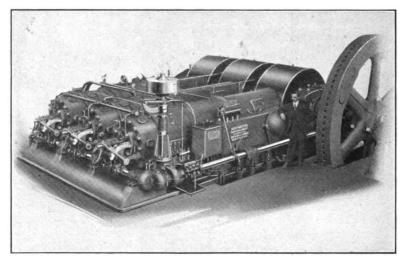
WORTHINGTON PUMP AND MACHINERY CORPORATION

115 Broadway, NEW YORK

SNOW-HOLLY WORKS: BUFFALO, N. Y.

Oil Engines
Gas Engines

Branch Offices in All Principal Cities
Oil Line Pumps
Gas Compressors



50

THE WORTHINGTON-SNOW OIL ENGINE—A SELF-CONTAINED POWER PLANT:

This oil engine is of the four-cycle, single, twin or three cylinder type and operates on the high compression cycle. On account of this latter feature there is no sudden rise in pressure with the result that the wear due to shock is eliminated. The temperature of the compressed air is sufficient to ignite the fuel so that a hot bulb or ignition apparatus of any kind is not required.

We have developed a spray nozzle or atomizer which completely converts into fine spray the heaviest grades of asphalt base crude oils from the Mexico and California fields as well as the lighter fuel oils and distillates from the eastern and mid-continent fields. Snow oil engines are simple, reliable, and can be depended upon for continuous service. In their design particular attention is given to accessibility and the reduction of operating attention to a minimum. They are rated conservatively and are subjected to a rigid brake test on our erecting floor before shipment. They are adapted to all power purposes, including belting to generators or line shafts, direct connection to generators for parallel operation, and direct connection to oil line pumps, air compressors or ammonia compressors.

Our standard fuel guarantees, based on crude oil, distillate, or fuel oil of 18,500 B. T. U.'s per pound containing not over 1% of water, are as follows:

.48 lb. per B. H. P. hour at full load. .50 lb. per B. H. P. hour at ¾ load. .57 lb. per B. H. P. hour at ½ load. Ask for further detailed information.

(See page 180 for additional products of this Company)

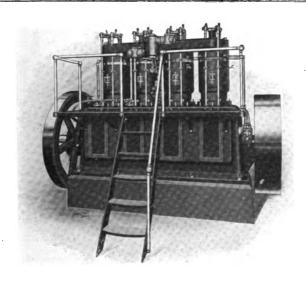
HOPE ENGINEERING & SUPPLY CO.

MT. VERNON, O.

TULSA, OKLA.

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Consulting and Contracting Engineers in Natural Gas and Petroleum Laboratory and Field Tests—Reports



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BUILDERS OF REEVES VERTICAL GAS ENGINES:

Any Power up to 200 H. P., Natural, Artificial and Producer Gas.

REEVES AIR AND GAS COMPRESSORS:

Plate Valve construction for high speeds.

Manufacturers of:

HAMMON PIPE COUPLER for Oil, Natural Gas and Water Lines in any Service.

HEAT EXCHANGERS for Treatment of Oil and Gas in Refineries, By-Product Coke Plants, Etc.

ABSORBERS for Gasoline Absorption Plants, Chemical Works, Etc.

Correspondence Solicited.

DATA ON REEVES VERTICAL GAS ENGINES

H. P. Nat. Gas		Cylinde	er	R. P. M.	Shipping	Floor	Standard
	No.	Div.	Stroke	K. 1. M.	Weight	Space	Pulley
18 40 60 80 100 135 150 170 200	1 2 3 4 8 4 4	9 14 9 14 9 14 9 14 11 14 12 14 12 14	11½ 11 11 11 13 13 13 14	300 300 300 300 275 275 275 275 275	5800 9000 12500 17000 20000 26000 28000 36000 40000	48x54 72x58 88x58 104x58 106x76 126x76 128x16 144x80	24x 8 30x10 36x12 36x14 54x14 54x19 Special

Prices Furnished on Application.



A. E. OLMSTEAD & SONS

ONTARIO IRON WORKS

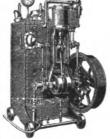
POLASKI, N. Y.

Manufacturers of The Safe Steam Engine & Water Tube Boiler
Also Ontario Gasoline Motors

THE SAFE STEAM ENGINES AND BOILERS are automatic in every way possible, and have made their own introduction during the last twenty-five years by being the most economical power and steamer known, and being so compact they are adapted to all kinds of situations where room is limited. There are no conditions, outside or inside, to which their application is not perfect.

In this rig you have one that will burn any kind of fuel, and will make all the steam required for heating, power

purposes, creamery and dairy work, sterilizing, cooking, laundry work, etc. The boiler and engine is furnished complete, or to boiler alone where no engine is required. The water capacity of the boiler is 15 quarts per H. P., and as they are equipped with



automatic water feed, the water is constantly fed to the full requirements of the boiler. There is no trouble in making steam in ten minutes from cold water. The boilers are tested at 150 lbs. cold water pressure, and are subjected to 125 lbs. steam pressure. Each one has twelve square feet heating surface per H D

The boiler is air spaced and furnished with dumping grates for either coal or wood, and has automatic damper regulator. The great economy of this boiler is in the use of fuel, quick steamer, and the little room it occupies. They are built in sizes, 3, 4, 5, 6, 8, 10, 12 and 15 H. P. For house heating they are equipped with low pressure fittings.

The engines are double valve, the cutoff valve being operated by the automatic governor in the fly-wheel, and are set to run from 250 to 325 revolutions per minute. The pistons are fitted with expansion ring breaking joints on onethird of the circle of the cylinder.

ONTARIO GASOLINE MOTORS:



THE ONTARIO line of motors consists of the following line of two-cycle three-port, valveless sizes:

Horse Power	Cylinders	Bore	Stroke
2	single	25%"	3"
6	single two	31/2"	312"
9	three	312"	312"
12 7	four single	5"2"	5"2
14	two	5"	5"
21 28	three four	5"	5"

These motors are free from all complicated mechanism and are remarkably free from vibration, owing to their correct design and construction. The center of gravity is extremely low, and the flanges by which the motor is secured to its foundation, are in line with the center of the crank shaft. These motors are equipped with either jump spark and timer or with high tension magneto.

The 2 H. P. single cylinder motor is especially constructed for direct connecting to centrifugal pumps. Valve trouble has been eliminated by doing away with all valves.

Catalog in English or Spanish.

C. F. WENDLAND ENGINEERING AND CONSTRUCTION CO.

EMERGENCY CALLS Flatbush 1010 & 5612 C. F. WENDLAND, M.E.

TELEPHONE Canal 8308

atbush 1010 & 561 Evergreen 4969

63 Wooster St., NEW YORK

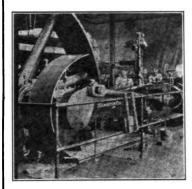
SPECIALTIES

General Repairs and Complete Installation of Engine Room Equipment
Stationary Marine Refrigerating

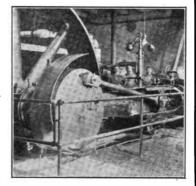
Repair Shop Ready for Operation Day or Night

Attention Given to Developing Inventions and Inventors' Experimental Work

ALTERING 24" x 48" CORLISS ENGINE







To Balanced Disc Crank

COMPLETE INSTALLATIONS

For Entire Power Plant
Steam and Electric

GENERAL REPAIRING

To Entire Plants

Steam

Electric

Refrigerating

Engine and pump cylinders rebored and crank pins turned in position.

Valves reseated and repaired in position.

Engines indicated and valves adjusted.

Boilers retubed and reset—steam and hot water heating. .

Repair Shop Ready for Operation Day or Night.

Our large force of skilled workmen and accurate portable tools can completely overhaul every boiler, engine, ice machine, pump, compressor, generator, motor or other machinery right in your own plant. All work is positively guaranteed and backed by years of experience in this field.

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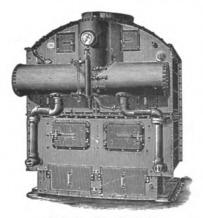
ALMY WATER TUBE BOILER CO.

PROVIDENCE, R. I.

Sectional Water Tube Boilers for Every Marine Purpose

ALMY PATENT SECTIONAL WATER TUBE BOILERS:

The Almy Boiler is in every respect a Pipe Boiler, being constructed of Extra Strong Iron Pipe and Malleable Iron Fittings. As the threads are standard size, repairs may be made conveniently in almost any part of the world. Due to design, expansion and contraction is entirely taken care of and sudden change of temperature has no bad effect on the heating surface. 75 lbs. to 100 lbs. of steam may be raised from cold water, within seven minutes, with perfect safety.



Exterior-Class B, C, D

We build six classes or types of boilers—A, B, C, D, E and Z. Type is determined according to the desired duty. Sizes run from 2.7 to 56 sq. ft. of grate surface and 87 to 2,000 sq. ft. of heating surface.







Exterior Class A

An evaporation of 11.92 lbs. of water, from and at 212° per pound of combustible, has been shown on a 45 H. P. boiler—rate of combustion 14 lbs. per square foot of grate surface per hour. The same boiler under forced draft evaporated 7.89 lbs. of water per pound of coal—gage pressure 153 lbs., feed temperature 56°, rate of combustion 35.98 lbs. of coal per square foot of grate surface per hour.

The large amount of fire-box heating surface receiving direct heat is an important feature. In our Class D and E boilers, there is 90% more of such heating surface than in a flat-sided fire box of equal dimensions.

These boilers are very satisfactory with oil burners as quite a number of installations on the Pacific Coast have proved.

Our business is principally marine but we occasionally furnish boilers for stationary use. "Knocked down" boilers may be shipped in 400 lb. packages and under.

Catalogue containing full description of construction will be sent on application.

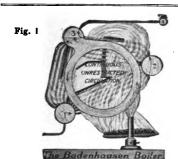
55

BADENHAUSEN CO.

1425 CHESTNUT ST., PHILADELPHIA, PA. MAIN OFFICE:

WORKS: Cornwells, Philadelphia, on P. R. R. & Delaware River; Bound Brook, N. J. NEW YORK PITTSBURGH BIRMINGHAM, ALA. CHICAGO DENVER SAN FRANCISCO

Manufacturers of Badenhausen Land and Marine Water Tube Boilers and Superheaters; American-Ball and Marine Type Engines; Scotch Marine Boilers



THE BADENHAUSEN WATER TUBE BOILER in all its forms was designed and perfected by John P. Badenhausen, M.M.E., whose expert knowledge in economical and efficient steam production has enabled him to place on the market a boiler having positive, continuous, and unrestricted circulation with the attending ability to operate at daily high efficiency and to respond to instantaneous, unlimited, and long-continued overloads without heat waste or boiler injury. In addition to these high water marks in boiler design is the ability to deliver at the boiler outlet, steam that is dried and superheated to a guaranteed average of not less than 10 deg. Fahr. at any rating.

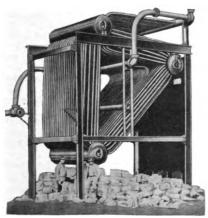


Fig. 2

THE PRINCIPLE OF PERFECT CIRCULATION (Fig. 1) is best illustrated by a glass ring superimposed upon the boiler, proving that the water has a

path of equal area throughout, leaving no part dry to the action of the fire. Curved steel tubes connect steel drums numbered 1, 2 and 3. Feed water enters Drum 1. The steam, disengaged in Drum 3, is dried and superheated in tubes connecting Drums 3 and 4. For high degrees of superheat, Simplex Superheaters are pro-

vided (Figs. 2 and 3).

The Badenhausen Water Tube Boiler is built in Standard design (Figs. 1 and 2), Preheater design (Fig. 3) and in doubleended forms of these designs. The boiler

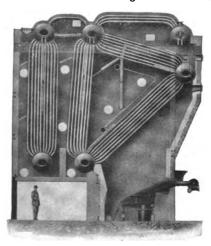


Fig. 3

and furnace dimensions are varied to meet varying steam requirements and space conditions. Combustion areas are accurately designed. Each boiler as a whole is flexibly attached to a rigid steel structure (Fig. 2). Hinged drum manhole doors and convenient setting doors provide easy access. All parts of boiler can be touched by the hand. The construction conforms to the A. S. M. E. Boiler Code requirements.

The Badenhausen Co. shops at Cornwells, Pa., produce Badenhausen Water Tube Boilers, Simplex Superheaters, also Scotch Marine Boilers without any punching of holes as all holes are drilled from the solid.

Send for catalogues and specifications.

THE BABCOCK & WILCOX CO.

GENERAL OFFICES:

85 LIBERTY STREET, NEW YORK

Water Tube Steam Boilers, Steam Superheaters, Mechanical Stokers

BOSTON, 49 Federal St.
PHILADELPHIA, North American Bldg.
PITTSBURGH, Farmers Deposit Bank Bldg.
CLEVELAND, Guardian Bldg.
CINCINNATI, Traction Bldg.
ATLANTA, Candler Bldg.
NEW ORLEANS, 533 Baronne St.
HOUSTON, TEX., Southern Pacific Bldg.

CHICAGO, Marquette Bldg.

DENVER, 435 Seventeenth St.

SALT LAKE CITY, 705-6 Kearns Bldg.

SEATTLE, L. C. Smith Bldg.

SAN FRANCISCO, Sheldon Bldg.

LOS ANGELES, Central Building

HAVANA, CUBA, Calle de Aguiar 104

SAN JUAN, PORTO RICO, ROYAL BANK Bldg.

TUCSON, ARIZ., SANTA Rita Hotel Bldg.

WATER TUBE STEAM BOILERS:

Babcock & Wilcox

Babcock & Wilcox Marine

Stirling

Rust

56

Boiler practice has changed materially in the past ten years. Higher pressures and higher superheat have come into every-day practice and with these changes have also come larger units and higher rates of combustion, due to better stokers and furnace arrangement, better methods of feed water treatment, improved coal and ash handling apparatus and a better understanding of the care and operation of boilers. During this period great improvements have been made in the utilization of other fuels than coal. These developments have brought about a change in boiler room design and

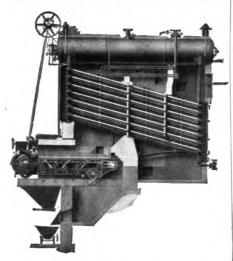
necessitate a much more careful study of the size of plant, service conditions, fuel, water, and class of boiler room help available.

By reason of the different factors involved the selection of a proper boiler unit is much more complex than in the past. Years ago this Company manufactured a line of so-called "standard" boilers; while these standards are still in existence, the sale of a standard boiler today is a rarity, for the reason that operating conditions cannot be even approximately standardized. Each and every prospective boiler sale is approached by this Company as an entirely new and independent engineering problem, the various factors involved determining the particular type, size and setting of boiler offered.

These developments have brought about a change in boiler room design and Company is given on the following pages.

THE BABCOCK & WILCOX CO.

THE BABCOCK & WILCOX BOILER:



The heating surface of the boiler is made up of drums extending longitudinally over the other pressure parts. To the drums there are connected, through forged-steel cross boxes at either end, the sections made up of headers and tubes. At the lower end of the sections there is a mud drum extending entirely across the boiler and connected to all of the sections. The connections between all parts are made by short lengths of tubes expanded into bored seats.

The headers into which the tubes are expanded are of forged steel and are of serpentine or sinuous form so that the tubes are disposed in a staggered position when assembled as a complete boiler. This staggering of the tubes breaks up the gases and causes them to impinge on every tube.

Opposite each tube end in the headers there is placed a handhole of sufficient size to permit the inspection, cleaning or renewal of a tube. These handholes 'are closed by suitable handhole fittings.

The gases of combustion are caused to make three passes over the heating surfaces by baffles constructed of special baffle brick and cast-iron flame plates.

The form of the furnace is such that it is readily adaptable to the fuel available, whether solid, liquid or gaseous.

Boilers are suspended front and rear from

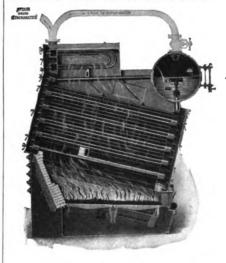
wrought-steel supporting frames, entirely independent of the brickwork.

Patented dusting doors furnish a means of keeping all portions of the heating surfaces free from soot and dust. Large doors in the sides of the setting give full access to all parts for inspection and for the removal of any accumulation of soot.

THE BABCOCK & WILCOX MARINE BOILER:

The Marine Type of Babcock & Wilcox boiler preserves the excellent features of the Land Type but adapts them to the conditions on shipboard. The tubes are usually of smaller diameter and are shorter than in the Land Type. The furnace increases in volume toward its exit and with its tile roof gives highly efficient combustion. The flame plates or baffles and the staggering of the tubes give the heating surface an efficiency unobtainable in any other boiler.

All parts subject to pressure are made of the highest quality of forged steel. No castings are used. The parts are as thick or thicker than the corresponding parts in cylindrical or Scotch boilers. The weight of the boiler, however, is less than one-half that of Scotch marine boilers for pressures above 200 pounds. There are 57 Babcock & Wilcox marine boilers which have



been in service for more than fifteen years which are still using the original tubes.

The Babcock & Wilcox marine boiler is especially adapted to the use of oil fuel. Where oil is burned, practically the entire surface of the furnace is composed of firebrick, insuring perfect combustion.

(Continued on next pages)

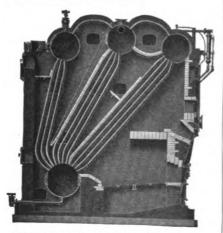
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(Continued from preceding pages)

THE BABCOCK & WILCOX CO.

85 LIBERTY STREET, NEW YORK

THE STIRLING BOILER:



The Stirling boiler consists of three transverse

58 steam and water drums set parallel and connected to a mud drum by three banks of water
tubes so curved as to enter the drums radially.
The steam space of the center drum, from which
steam is taken, is connected to the front and
rear drum by steam circulating tubes and to the
front drum by water circulating tubes.

The tubes are so spaced as to allow the removal of any tube without disturbing any other tube or the brickwork.

The furnace is formed by the use of a firebrick arch sprung across the boiler setting in the triangular space formed by the front wall and the front bank of tubes. This furnace readily lends itself to the installation of any stoker and the burning of any class of fuel.

The gases of combustion are led from the furnace over the heating surface by two baffles of firebrick tile, one resting on the rear row of tubes of the front bank and the other supported on the rear row of tubes of the second bank.

The boiler is supported on a wrought iron framework entirely independent of the brickwork setting.

Large cleaning doors in the sides of the setting give ready access to all portions for cleaning, inspection and repair.

THE RUST BOILER:

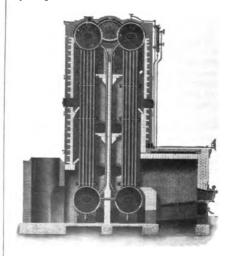
The Rust boiler is made up of two transverse steam and water drums and two transverse mud drums connected by banks of tubes. Each steam drum is connected to the mud drum directly below it by five rows of straight tubes and one row of curved tubes. The steam drums are connected by curved steam and water circulating tubes and the mud drums by water circulating tubes.

The tube sheets of all drums are pressed to form individual tube seats, thus permitting straight tubes to be expanded directly into the cylindrical drums. This construction is patented.

The tubes are staggered and are so arranged that any tube may be removed without disturbing any other tube or the boiler brickwork.

The furnace is of the extension or Dutch oven type and, being distinct from the boiler setting proper, enables any type of furnace or any fuel to be used.

The gases are caused to make two passes over the heating surface by a vertical firebrick baffle built between and held in position by the central curved tubes. Horizontal baffle shelves cause all portions of the heating surface to be swept by the gases.



The boiler is supported entirely free of the brickwork on cast-iron saddles under the mud drums, the saddles resting on masonry foundations.

THE BABCOCK & WILCOX CO.

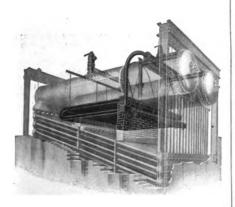
THE BABCOCK & WILCOX STEAM SUPERHEATER:

The Babcock & Wilcox superheaters, as built for installation in all boilers of The Babcock & Wilcox Co.'s manufacture, are similar in design, location and operation. The construction is modified in certain details to meet the specific requirements of individual boilers.

The superheater consists of two headers or manifolds, into which tubes bent to a U-shape are expanded. These headers are equipped with handholes and forged-steel handhole fittings, giving access to each tube end. As there is no rigid connection between the headers and because of the proper methods of suspension, there can be no strains set up in the apparatus by contraction or expansion. Each superheater is equipped with an independent steel-bodied, outside-spring, safety valve.

The superheater in all cases is located in the direct path of the products of combustion. The surfaces presented to these gases are smooth, offer the minimum resistance to the passage of the gases and the least opportunity for the adhesion of dust.

Steam is taken from the steam space of the boiler through the dry pipe, is introduced into the intake header and passes through the super-

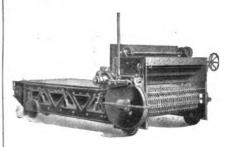


heater tubes to the outlet header, to which the superheated steam connection from the boiler is made.

THE BABCOCK & WILCOX CHAIN GRATE STOKER:

The Babcock & Wilcox chain grate stoker consists of a grate in the form of an endless chain passing at the front and rear of the boiler furnace over sprockets which are keyed to shafts carried

by the stoker frame. The passage of the grate through the furnace is continuous. The stoker is driven through a worm wheel keyed to the front sprocket shaft. The fuel is fed uniformly to the front end of the grate under an adjustable



stoker gate. The volatile gases are driven off on the forward portion of the grate under an ignition arch and are completely consumed in passing over the incandescent fuel bed before striking the boiler heating surface. Combustion is truly progressive. The ash and refuse are discharged automatically and continuously as the grate turns over the rear sprockets.

The form of the grate links is such as to allow proper admission of air for combustion. Suitable side seals and a bridge wall water box prevent the admission of large quantities of excess air. The bridge wall water box is connected into the water circulation of the boiler and is part of the regular stoker equipment.

The construction of the entire stoker is of such rugged character throughout as to permit continuous operation without the necessity of shutdowns for repair.

This stoker will only be offered for installation where fuel suitable for chain grate stokers is available.

Over 25,000,000 horse power of boilers manufactured by The Babcock & Wilcox Co. are in use throughout the world.

The Babcock & Wilcox Co. publishes the following books: "Steam," "Marine Steam," "Strling," "Rust," "Steam Superheaters," and "Chain Grate Stokers," any of which may be obtained upon application to the nearest of the Company's branch offices.

THE BIGELOW COMPANY

WORKS AND MAIN OFFICE

76 RIVER ST., NEW HAVEN, CONN.

NEW YORK OFFICE, Singer Building

BOSTON OFFICE, Oliver Building

PHILADELPHIA OFFICE, Commercial Trust Building

Manufacturers of Fire Tube and Water Tube Steam Boilers, Heavy Plate Steel Work

THE BIGELOW-HORNSBY WATER TUBE BOILER:

Some of the features of the Bigelow-Hornsby Boiler that meet the requirements of Modern Power House Practice:

Unlimited size of units.

Small ground space occupied.

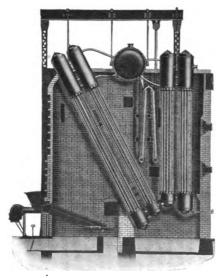
Coldest water meets the coldest gases.

All parts, both external and internal, readily accessible.

All boiler tubes perfectly straight.

Circulation of water and liberation of steam unrestricted.

Very dry steam, also ample room for super-heaters where required.



Bigelow-Hornsby Boiler

High continuous economy due to extreme cleanliness of the most efficient heating sur-

Arrangement of baffling is such that the gases pass over the heating surface in thin streams and uniformly at every point.

Furnace arrangement is ideal for securing per-

fect combustion, as furnace is correctly shaped and of ample size.

Greatest flexibility, both as to construction and in steaming qualities.

No cast iron used in any portion of the boiler

proper.

Constructed both as to workmanship and material in accordance with the most advanced boiler practice.

THE BIGELOW-MANNING BOILER:

This type of boiler can be constructed suitable for 200 pounds working pressure. The shell sheets being away from contact with the fire permits the use of any thickness of shell necessary for high

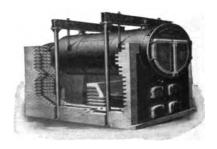
shell necessary for high pressures.
The e c o n o m i c a l evaporative performance of the Bigelow-Manning Boiler is remarkable. All radiant heat from the fuel bed is absorbed directly by is absorbed directly by water-heating surface, the distribution of the furnace gases over the heating surface is prac-



heating surrace is practically uniform, the Bigelow-Manning superheat furnished is varied by changing the water level, there are no losses due to the infiltration of air in the setting and stand by leases are comparatively small. and stand-by losses are comparatively small, occupying per H. P. much less ground space than other types of boilers.

RETURN TUBULAR BOILER:

The advantages of compactness and efficiency, large direct heating surface, easy cleaning, large



Suspension Type of H. R. T.

liberating surface, perfect circulation and minimum liability and ease of repairs, are well-known features of this type.

Our boilers are constructed in the most approved manner; we adopt the very highest type of professional and mechanical

service, maintain the highest possible standard of efficiency, and believe our facilities for boiler construction are without a parallel.



THE BROWNELL COMPANY

DAYTON, OHIO

SALES REPRESENTATIVES IN ALL SECTIONS OF THE COUNTRY

Manufacturers of Engines, Boilers, Feed Water Heaters and Tanks

BOILERS:

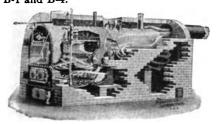
Types—Horizontal Tubular, Locomotive Type Portable, Scotch, Vertical Tubular, Firebox Heating, Oil Country.



H. T. Boiler with Steel Casing

The Company is prepared to build firetube boilers of all types according to the A. S. M. E., various state and municipal Codes. Only the best quality material is used. The design, as well as the workmanship, is of the highest grade and according to the latest known practice. Horizontal Boilers are built in sizes from 15 to 250 horsepower for steam pressures up to 150 pounds.

Steel casing settings, as illustrated, are especially economical, practically eliminating the defects of brick settings and reducing maintenance expense. Bulletins B-1 and B-4.



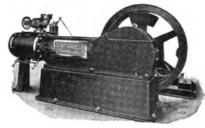
Smokeless Firebox Heating Boiler

Brownell Smokeless Firebox Heating boilers are built according to the A. S. M. E. Code for either steam or hot water installation and to meet the most rigid smoke ordinances. Direct draft boilers are built for use where not prohibited by smoke ordinance. Both types are widely used for heating Apartments, Factories, Schools, etc. Bulletin B-6.

STEAM ENGINES:

Types—Automatic, Throttling, Fan, Variable Speed Duplex, Vertical, Oil Country Drilling.

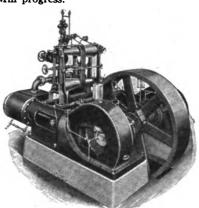
Brownell engines are especially designed for severe and continuous service. Horizontal engines are of the side crank type with slide valves. Vertical engines are center crank, the Enclosed Verticals also have piston valves.



Enclosed Automatic Engine

High Speed Automatic engines are built in the enclosed self-oiling or the open type. The inertia governor in the fly wheel is guaranteed to regulate the speed of the engine within 2% from friction to full load. Bulletins E-1 and E-2.

Variable Speed Duplex engines were especially developed and are constantly being improved to keep pace with Paper Mill progress.



Variable Speed Duplex Engine
Illustrated bulletins of Brownell Products will be mailed upon request.

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THE CASEY-HEDGES CO.

Founded 1889

CHATTANOOGA, TENN.

CHICAGO MEMPHIS DALLAS New Orleans Seattle Havana, Cuba New York Birmingham San Juan, P. R.

Manufacturers of All Types of Boilers and Plate Metal Work

Boilers built in accordance with A. S. M. E. Code when desired.

C-H HORIZONTAL WATER TUBE BOILERS:

All steel construction. Built in units from 75 to 1000 H. P. Oval handholes with machined surfaces. With either Horizontal, Vertical or Combination Baffles. Large areas through water legs permitting rapid circulation. Boiler supported free from brick work by wrought steel supporting frame at front end; the rear by columns with expansion saddles and rollers.

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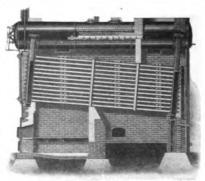
C-H HORIZONTAL WATER TUBE BOILERS:

With Steel Cased Setting

This type of setting entirely overcomes the defects of the brick setting, which consist chiefly of air leaks due to expansion and contraction; also reduces maintenance cost and decreases cost of foundations. Steel casings may be applied to either the Horizontal or Vertical Baffle types. The steel casing may also be used in conjunction with stokers.

C-H CROSS DRUM WATER TUBE BOILER:

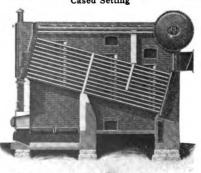
Designed for heavy duty power plant service and continuous overload conditions. Built of all steel construction, in units from 75 to 2,000 H. P. Boiler is of sectional construction, may be shipped knocked down and is especially desirable for export work. Boiler may be equipped with Superheater and arranged for any type of Stoker.



C-H Horizontal Water Tube Boiler, Vertical Baffle



C-H Horizontal Water Tube Boilers with Steel Cased Setting



C-H Cross Drum Water Tube Boiler

THE CASEY-HEDGES CO.

C-H VERTICAL WATER TUBE BOILER:

This boiler is of simple construction and very efficient. Consists of one or more upper drums, connected to one or more lower drums by a series of tubes placed in staggered rows. Baffles are set vertically in boiler and may be arranged for either two or three passes of the hot gases through the tube heating surface. Tubes enter drums radially, and are curved to an easy radius. Boiler is of unit construction; therefore, the size is unlimited. Furnace is of Dutch Oven construction.

C-H VERTICAL WATER TUBE BOILER WITH STEEL CASING:

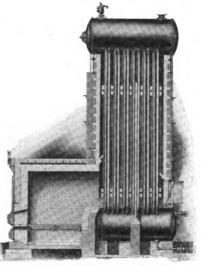
The C-H Vertical Water Tube Boiler is an ideal boiler when steel-encased. A special design of steel casing is used, built in sections. Each section is provided with tie bar lintels that hold the wall in place, preventing buckling or bulging inward of the brick work. It is unnecessary to discuss the value of the steel casing, as it is well known.

C-H HORIZONTAL RETURN TUBU-LAR BOILER WITH STEEL CASING:

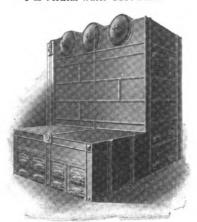
We originated the steel cased type of boiler setting, and have perfected three well-known types; viz., Standard, Full Dutch Oven and Semi-Dutch Oven. Steel Casing construction of heavy steel and braced with angles. Will save $33\frac{1}{3}\%$ in brick work and 60% in foundation. The steel setting is absolutely air-tight; does away with expansion leaks in brick work; has practically no maintenance cost; assembled complete before shipping; may be installed by a novice.

Catalogue of the Casey-Hedges' Products Will Be Furnished on Application.

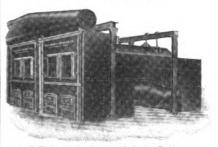




C-H Vertical Water Tube Boiler



C-H Vertical Water Tube Boiler with Steel Casing



C-H Steel Casing for Tubular Boilers

COATESVILLE BOILER WORKS

SALES OFFICE: NEW YORK, N. Y. 30 Church St.

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Works: COATESVILLE, PA. SALES OFFICE:
PHILADELPHIA, PENNA.
Morris Building

Manufacturers of A. S. M. E. Code Horizontal Return Tubular Boilers, Steel Tanks for all Purposes and Heavy Steel Plate Construction

COATESVILLE A. S. M. E. CODE BOILERS:

We are carrying in stock for immediate shipment Boilers ranging from 85 to 250 Horse Power.



Coatesville A. S. M. E. Code Boilers Ready for Immediate Shipment

The American Society of Mechanical Engineers a few years ago formulated standard specifications for the construction of steam boilers and this service is of such far-reaching importance that the Society should have the highest praise for its efforts. Many of the States have already adopted this "boiler code" and many others will adopt it in the near future, thus eliminating the loss of life and property due so frequently to boilers of poor design and faulty construction. This "boiler code" enables the user to buy only such boilers as will pass the A. S. M. E. requirements. The code boiler of today is far superior to many of the best makes that were placed on the market a few years ago. However, in order to be assured of the best constructed boiler, one must purchase it from a manufacturer who is using his best efforts to improve his product and build up a business for the future, through satisfied customers, rather than to simply try to build as cheaply as possible and still pass the A. S. M. E. requirements. The Coatesville Boiler Works are known throughout the trade as manufacturers of strictly high grade boilers. This reputation has been gained through thirty-five years of experience. When you buy a Coatesville Boiler you are assured of a boiler that will give you the best of satisfaction.

The A. S. M. E. Code has little or nothing to say about casting and fittings. In practically all cases boilers are accompanied with fronts, buckstays, grates and all miscellaneous castings and the usual valves and fittings. Our Foundry Department manufactures all of our boiler fronts and castings under our direction. Too often the purchaser gives little or no consideration to the castings and fittings specified. The usual castings and fittings of a high grade specification will represent about one-third of the total sales price and should, therefore, be given careful consideration. Our style "C" front, designed to provent front, designed to prevent warping and cracking, has been used for over twenty years and is as well known as the "Coatesville Boiler." Our specification, therefore, includes not only a high grade boiler, but also castings and fittings well designed, of heavy weight and in keeping with the boiler itself.

STEEL TANKS:

Storage tanks in stock ready for immediate shipment.

We manufacture Steel Tanks for all purposes—high pressure, acid, oil, chemicals and general storage purposes. The workmanship and materials in these tanks are unsurpassed by any other manufacturer. Our reputation as manufacturers of the "Coatesville Boiler" is equally well known in our Steel Tank Department.

MISCELLANEOUS STEEL PLATE CONSTRUCTION:

Under this heading we might include all heavy steel plate work, built to fill your special requirements. Your inquiries forwarded to our nearest sales office will receive prompt and careful attention.

Our shops are large and well equipped with modern machinery for fabricating heavy steel plate work; they are next adjoining two very large plate mills and thus we are able to make prompt shipments. There is not another steel plate fabricating shop in the United States so advantageously located.

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R. D. COLE MANUFACTURING CO.

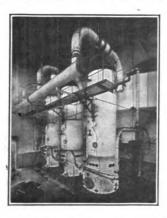
Established 1854

NEWNAN, GEORGIA

Manufacturers of Boilers, Engines, Elevated Tanks, and Steel Plate Work

COLE-MANNING BOILER:

This type boiler is constructed in units up to 400 horse power and for pressure of 200 lbs. or more. Boiler shell is supported on a one-piece cast iron base, which can be fitted with stationary or shaking grates. Smoke box provided with removable cast iron cover and provided with connection for all standard soot-cleaning devices.



The evaporative performance, super-heating qualities and small floor space per horse power contribute to make this type boiler a most desirable and economical unit.

HORIZONTAL RETURN TUBULAR BOILER:

These boilers are constructed in a most approved manner and of materials in full accordance with the A. S. M. E. Code. Standard settings can be provided with stationary or shaking grates and where increased efficiency and compactness are desired, standard steel casings can be provided for these settings. These boilers are designed with liberal proportions of heating surface, steam space and grate area, and within the limits of their use-

fulness are unsurpassed as steam generators. These boilers are constructed in



units up to 250 horse power and for steam pressure of 200 lbs. per square inch.

ELEVATED STEEL TANKS:

Special designs for steel sprinkler tanks or domestic service will be furnished by our Engineering Department. Our elevated tanks are correct in design and the simplicity of the structure contributes to its low cost of maintenance. Sprinkler tanks and equipment are designed to incorporate the recommendations of all in-



surance authorities. Our facilities provide for the design and construction of all

forms of steel plate work, including STACKS, ACID TANKS, PRESSURE VESSELS, STRUCTURAL

FRAMES AND TOWERS.

OUR ADVIS IN

ENGINEERING

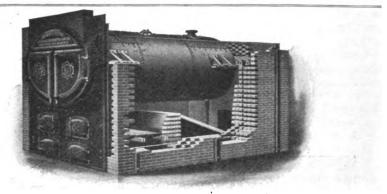
D. M. DILLON STEAM BOILER WORKS

Established 1870

Incorporated 1906

MAIN OFFICE AND WORKS: FITCHBURG, MASS.

New York Office 30 Church Street SOUTHERN REPRESENTATIVE J. S. Cothran, Charlotte, N. C.



All Steel Horizontal Keturn Tubular Boiler

We are Equipped to Furnish:

BOILERS (A. S. M. E. & Mass. Standard):

For high pressure service, 150 to 200 lbs. working pressure; all fire tube types such as Horizontal Tubular, Straight Upright, Manning Upright, Locomotive and Marine

STACKS:

Guyed and Self-Supporting, any diameter and height.

TANKS:

Any capacity, type, pressure or vacuum.

ROTARY KIERS:

Special construction for all classes of work.

KIERS:

Special construction for any class of work, high or low pressure.

VULCANIZERS:

Special construction for various classes of work.

BOILER TUBES:

All standard sizes; safe ending old tubes a specialty.

SMOKE FLUES:

For any size or type of boiler, any thickness of material.

PLATE WORK:

· All kinds.

HIGH PRESSURE BOILERS AND LARGE UNITS:

To meet the increasing demand for higher pressures and larger units, we have gone carefully into the matter of thick shell plates and have found that when used in boilers of proper design and construction, they are perfectly reliable in every way.

We have built many horizontal return tubular boilers for 200 lbs. working pressure using shell plates ¾" thick, planed down to about ½" at the girth seams, and the years of satisfactory service they have given prove that our contention as to the use of thick plates is correct; also that our design and construction methods are the best.

We build horizontal return tubular boilers in units from 10 horse power (24" diam.) to 600 horse power (108" diam.).

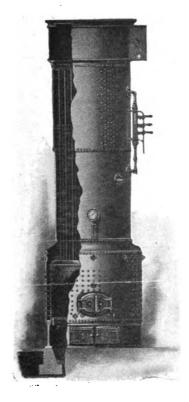
Illustration shows all steel boiler (nozzles, brackets, manhole covers, yokes, etc., all of steel) set with full overhanging steel front of special design. Note the tie rods above and below fire line; also stiffeners to prevent warping.

D. M. DILLON STEAM BOILER WORKS

FITCHBURG, MASS.

MANNING BOILERS:

(A. S. M. E. and Mass. Standard)



Manning Boiler, Showing Elevation and Section and Solid Cast Iron Base upon Which It Sets

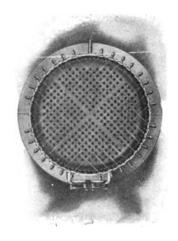
The Manning type of upright boiler (see cut) is perfectly adapted to all the requirements of the highest pressures and the largest units, because no plate subject to tensile strain comes in contact with the fire. It is the best boiler for turbines on account of its ability to furnish steam superheated 25 to 50°; the amount of

superheat may be increased by lowering the water line or by using longer tubes.

It is well suited for any locality regardless of water conditions when made with the multiple plan of cleaning handholes which give access to every part of the crown sheet (see cut). The outside furnace plate is sometimes carried a little higher and a 12" x 16" manhole placed opposite the crown sheet, thus providing additional facilities for cleaning and internal inspection.

This boiler being self-contained, requires no brick setting; consequently the expense of maintenance is low, and the efficiency is uniformly high.

67



Horizontal Section of Manning Boiler, Showing Multiple Plan of Handholes

We build Manning boilers in sizes from 50 horse power to 500 horse power for any working pressure.

68

EDGE MOOR IRON COMPANY

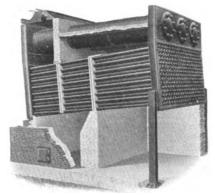
EDGE MOOR, DELAWARE

New York 111 Broadway

Boston 79 Milk Street CHICAGO 10 S. La Salle Street

Manufacturers of Edge Moor Water Tube Boilers

The Edge Moor Water Tube Boiler is designed for heavy duty under exacting conditions and is built to conform to the best standards. All Edge Moor boilers are constructed in accordance with the A. S. M. E. Boiler Code.



except when the laws of states or localities where the boilers are to be

For modern power plants where high pressures are desirable the special features of the Edge Moor design and the careful construction of the boiler produce a sturdy boiler that meets the demands of continuous, hard service. As shown in the above illustration the drums are horizontal, and the tubes are straight. Every tube is accessible through an elliptical handhole in the header plate directly opposite and can be removed through either header.

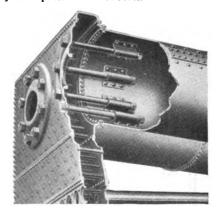
installed require variations from this code.

The illustration opposite indicates clearly the construction of the box headers and the large, unrestricted connection between headers and drums. Each header consists of a tube plate and handhole plate, effectively stayed, and connected together by forged troughs at top, bottom and sides. The headers extend at full width above the top of the drums.

giving additional space for the liberation and storage of steam. The drums are bolted to the headers by a special connection which eliminates the uncertainties of riveting in the field.

Each handhole is fitted with an oval cover which bears against the inside of the header plate and is removable through its own handhole. The edges of handholes are flanged inward for stiffening the plate and are machine-faced to insure a perfect bearing surface for the gaskets. Baffles are vertical and of three-pass or four-pass design.

Edge Moor boilers are custom built. Dimensions for a given horsepower are flexible, and every boiler is designed to produce the maximum efficiency under the operating conditions. All parts subject to pressure are of steel.



WASTE HEAT BOILERS:

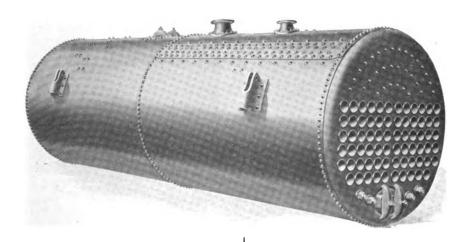
For the utilization of waste gases this company has developed an adaptation of its standard boiler, which contains all of the special Edge Moor features. This boiler is now being successfully operated in steel mills and cement plants, where, installed in accordance with the designs of our engineers, it has proved a commercial success.

THE FROST MANUFACTURING CO.

Established 1851

Works GALESBURG, ILL. GENERAL SALES OFFICE
112 W. ADAMS ST., CHICAGO, ILL.

Manufacturers of Steam Engines; Horizontal, Tubular, Vertical, and Fire-Box Boilers; Open and Closed Feed-Water Heaters and Purifiers; Tanks, Air Receivers, Special Plate Work, Etc.



69

Frost

RETURN TUBULAR BOILERS:

Our Horizontal Return Tubular Boilers are built to the requirements of the A. S. M. E. code from 36" to 108" diameter and for working pressures allowed by the code. All castings are made in our own foundry insuring the necessary grade of iron for the work. Exceptional drilling up to 150 H. P.

and plate planing facilities allow us to build for the highest pressures and the largest diameters. We are particularly careful in setting diagonal braces and through rods so our boilers can be accessible for inspection.

Our Vertical Boilers are regularly built in sizes up to 60 H. P.

Our **Fire Box Boilers** are built in sizes up to 150 H. P.

ERIE CITY IRON WORKS

ERIE, PENNSYLVANIA

Manufacturer of Vertical Water Tube Boilers, Horizontal Water Tube Boilers, Return Tubular Boilers, "Economic" Portable Boilers, Shaking Grates

HORIZONTAL WATER TUBE BOILER:



What is your operating boiler efficiency? Erie City Horizontal Water Tube Boilers are so designed as to make possible maximum efficiency under average conditions.

They are carefully constructed, only the best materials being used.

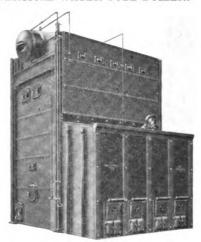
Some of the features responsible for the success of these boilers are its free circulation, ample steam liberating surface, large steam holding capacity, correct baffling and the correct ratio for heating surface. The tubes are of the most efficient diameter and length. All openings and outlets are conveniently placed and of the proper design. These boilers require the minimum headroom. The minimum amount of common and fire brick are needed for boiler settings.

The material is selected with utmost care, formed and cut with modern tools and fabricated by skilled mechanics who have had years of training in correct boiler building.

Erie City Horizontal Water Tube Boilers can be provided with regular grates, shaking grates, mechanical stokers, gas or oil burners. The furnace can be designed for wood, refuse, bagasse or similar fuels. They may be had with or without superheaters.

These boilers are regularly stocked in 7 sizes, 150, 200, 250, 300, 350, 400 and 500 Horse Power, with working pressures of 160, 180 and 200 lbs. Larger or higher pressure boilers built to order.

VERTICAL WATER TUBE BOILER:



These boilers are designed to deliver, and in actual operation do deliver more dry steam at the lowest cost than any other known type of boiler.

The tubes being upright, are completely surrounded by the moving gases, resulting in a maximum heat absorption, as well as very rapid circulation of water through the tubes.

A steam space (patented) at both ends of the upper drum makes it possible for you to get steam containing less than one-half of one per cent. moisture.

There are no handholes or other unnecessary and trouble causing joints.

The entire weight of the boiler is carried by a self-contained steel structure. The boiler is suspended by the upper drum and thus permits unrestricted expansion and contraction.

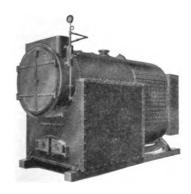
This boiler can be supplied with or without a superheater. Provision can be made for firing with various grades and kinds of fuel. Regular straight grates, shaking grates or any type of mechanical stoker may be applied.

These boilers are regularly carried in stock at our works in units up to 1000 Horse Power.

If you have an unusual condition to meet, as an extraordinary steam temperature, space limitations or fuel problem, let our engineering department aid you in its solution.

ERIE CITY IRON WORKS

ERIE CITY ECONOMIC BOILER:



For over 25 years the Economic tubular boiler has proven a gratifying success because of its careful and thorough construction, its mobility, its economy, safety and durability.

It is built different from the usual type of portable boiler. There are no stay-bolted water sides to fill with sediment and burn out or flat crown sheets to be exposed by low water and thereby cause an explosion.

The materials used are of the same high quality as our stationary types and conform to the requirements of The American Society of Mechanical Engineers. The furnace is fire brick lined with suitable air spaces to prevent excessive heat radiation warping plates.

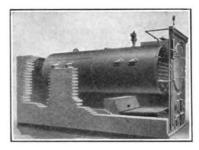
These boilers can be furnished complete with grates, steam gauge, water gauge, gauge cocks, safety valves, blow-off valves, check valves, stop valves, smoke stack and guys.

Boilers are subjected to hydrostatic test, 50% in excess of proposed working pressure. A certificate of inspection can be had by purchaser on request.

Made in sizes from 20 to 150 horse power for 100, 125 and 150 lbs. working pressure.



HORIZONTAL TUBULAR STATION-ARY BOILER:



Erie City Return Tubular Boiler

Made of the best material, correct design and fabricated by careful workmen. The best homogeneous steel is used. Tubes are standard gauge mild steel.

The design is the product of many years of experience and is in keeping with the best boiler practice. Butt joints, with inner and outer straps, are standard for longitudinal seams. Our plates are rolled the correct thickness throughout, checked by micrometer measurement. Ample bracing is used throughout. All openings and outlets are carefully designed for accessibility and safety.

The workmanship is kept at a high standard. All rivet holes are punched on a multiple punching table for accuracy, reamed and every rivet driven by machinery. Caulking is done with pneumatically driven round nosed tools. Tubes are set in reamed and chamfered holes with a roller expander and carefully beaded.

Erie City Boilers are designed with a minimum factor of safety of five.

Each boiler is subjected to a hydrostatic test 50% in excess of proposed working pressure and is carefully inspected throughout while under this pressure.

The stock sizes range from 20 to 200 horse power for 100 lbs. working pressure and from 50 to 200 horse power for 125 to 150 lbs. working pressure.

Catalogues describing our boilers will be sent on request.

HEINE SAFETY BOILER COMPANY

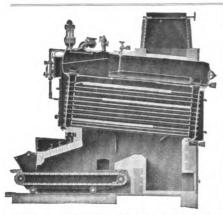
GENERAL OFFICE, ST. LOUIS, MO.

SHOPS: St. Louis, Mo. and Phoenixville, Pa.

NEW YORK
PHILADELPHIA
NEW ORLEANS

Boston Cincinnati PITTSBURGH CHICAGO DENVER SAN FRANCISCO DALLAS CHARLOTTE

Manufacturers of Heine Standard Longitudinal Drum Boilers, Heine Cross Drum Boilers, Heine Marine Boilers, Heine Steam Superheaters, Steel Stacks, Housings, Flues, Etc.



72 Heine Standard Longitudinal Drum Boiler Equipped with Chain Grate Stoker

THE HEINE STANDARD BOILER:

The Heine boiler is a modern boiler in every sense of the word. It is designed and arranged so as to insure to the greatest extent economy of fuel, safety and durability, economy in space occupied, accessibility for cleaning, etc. This end has been arrived at from years of experiment and improvement.

Heine boilers may be arranged to suit the conditions of any plant. This is said advisedly, for with scarcely an exception every problem that has been presented has been satisfactorily solved. Every type of mechanical furnace has been installed in connection with the Heine boiler. It is possible and usual to place such furnaces entirely under the boiler, thus not taking up any more floor space than with hand firing.

For details of construction and complete information, write for a copy of "Boiler Logic."

THE HEINE MARINE BOILER:

The standard Heine marine cross-drum water tube boiler, which has shown itself so superior for the peculiar and exacting marine service, consists essentially of three pressure elements joined together by a multiplicity of tubes. These elements are two flat rectangular box headers and a cylindrical steam drum.

The main bank of tubes extends between and connects the two box headers which are set with the flat surfaces a certain distance apart. The connecting tubes are all of the same length, straight and parallel with one another, and when this part of the boiler is set in operating position, are inclined at an angle of 16° to the horizontal, the rear header being elevated as shown

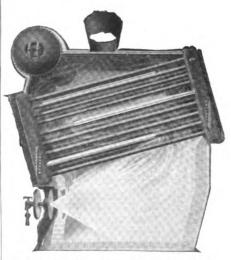
Above the front box header and slightly to the rear of it is placed the steam drum which is connected to the front header by a row of nearly vertical short tubes or nipples and to the rear header by a row of longer tubes which are horizontal when the boiler is set.

The boiler proper made up of drum, box headers and tubes, is supported by a strong, rigid steel structure resting on and secured to proper foundations in the vessel.

Heine Marine water tube boilers are built in accordance with the rules and regulations of the United States Board of Supervising Inspectors and are approved by Lloyd's Register of Shipping and the American Bureau of Shipping. When desired by the purchaser either insurance company is permitted free access to the Heine works and given every opportunity for inspection and approval of plans and material entering into the construction of the boilers.

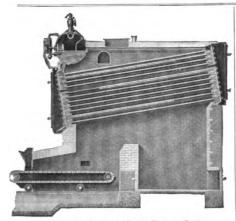
None but the very highest quality of skilled workmanship enters into the construction of Heine marine boilers. The Heine Safety Boiler Company has been building water tube boilers exclusively for 40 years and has a force of men and an equipment of tools and machinery especially fitted for this work.

For details of design and construction, write for a copy of "Marine Boiler Logic,"



Heine Marine Cross-Drum Boiler Equipped with Oil Burners

HEINE SAFETY BOILER COMPANY



Heine Stationary Cross-Drum Boiler

THE HEINE STATIONARY CROSS-DRUM WATER TUBE BOILERS:

This boiler possesses many of the advantages of the Heine standard longitudinal drum boiler. It is exceptionally well adapted for export shipment when transportation facilities demand limited piece weight and where freights are based upon measurement as well as actual weights of these pieces. The steam drum requires practically no crating and small articles may be packed within the shell. The box headers must be protected by crating but when so crated their measurements and scale weights correspond very closely. Tubes may be wired in bundles and the steel casing knocked down and arranged in compact packages.

Write for further information on the Heine stationary cross drum boiler.

THE HEINE SUPERHEATER:

As illustrated, the Heine superheater consists of two parts: the superheater box, and a nest or group of superheater tubes. The tubes are U shaped and are



of seamless drawn, heavy gaged, milled steel, 11/2 in. tubing expanded into the superheater box. This box is built similarly to the Heine water leg and consists of two hydraulically flanged steel plates jointed together all around by a butt strap. Hollow staybolts of the same size and design as those used in the boiler water legs are used to stay the superheater box and also being hollow permit of soot blowing.

The chamber in which the superheater is set communicates with the furnace by a flue formed in the side walls through which a small percentage of the furnace gas rises, entering the rear of the superheater chamber, flowing up over the outermost ends of the nest of U tubes, and then making a second and downward pass over the remaining tube surface. A damper in the superheater chamber outlet gives complete control of the volume of gases and is regulated from the front of the boiler either by hand or by an automatic temperature controller.



chamber, and the superheat can be maintained constant regardless of the boiler load, the rate of combustion, the amount of air used for combustion, the furnace temperature, the opening of furnace doors or any other variable, such as the amount of soot on boiler and superheater surface.

Flooding is unnecessary with the Heine superheater. No deposits of scaleforming impurities are formed. The Heine superheater admits of effective soot blowing, ready accessibility for repairs, safety and durability. MECHANICAL ENGINEERING

For further details and complete information, write for a copy of "Superheater Logic."

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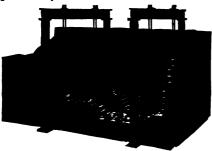
THE HOUSTON, STANWOOD & GAMBLE COMPANY

CINCINNATI, OHIO

Manufacturers of Steam Engines and Boilers

HORIZONTAL TUBULAR BOILERS:

We build all sizes of Horizontal Tubular Boilers up to 84"—20'—250 H. P. The 72", 78" and 84" diam. boilers in the 18' and 20' lengths are the most popular sizes and are also most efficient in respect to first cost per H. P. and operating efficiency We especially recommend The American Society of Mechanical Engineers' Boiler Code to prospective purchasers as the boiler specifications contained therein embody good boiler practice.



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Boiler with Full Flush Front and Suspension
Apparatus

STEEL CASINGS:

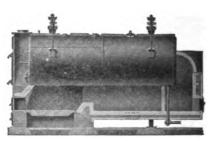
The steel casing boiler setting is a steel jacket for the brick work which secures an improvement in the economical performance of the boiler plant through almost entirely eliminating air leakage through the walls; also greatly reduces the maintenance expense through largely avoiding the necessity of repairs to the brick work, the brick lining being held rigidly in place by the steel jacket.



Steel Casing Boiler Setting with Flush Front

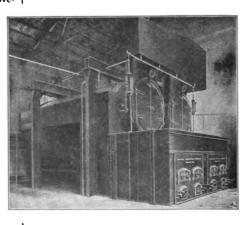
The style of steel casing illustrated is only one of the many designs of steel casings built by us.

The sectional view shows the relation of the brick lining and the insulating lining, the latter being placed immediately inside the steel plates of the casing. Through the use of insulating lining, such as diatomaceous earth, asbestos or other suitable material, the common brick ordinarily employed are almost entirely dispensed with, thus reducing radiation loss, the space occupied, the total weight and the amount of fuel required for raising steam when starting.



Sectional View Steel Casing Setting

Illustration below shows a battery of two boilers having steel casing settings. This installation happens to be equipped with Dutch ovens for burning low-grade, high-volatile bituminous coal.



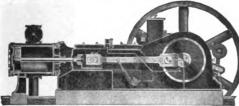
Installation of Two Boilers with Steel Casings

We also build locomotive firebox portable boilers, feed water heaters, smoke-stacks, heavy tanks, stills and do a wide range of similar work.

THE HOUSTON, STANWOOD & GAMBLE COMPANY

AUTOMATICALLY OILING ENGINES:





The sectional view will make clear our system of lubrication. The lubricating system is so de-

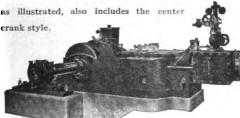
signed that the piping is completely enclosed within the bed plate, so that it does not have to be shipped separately and attached at destination.

There is a considerable demand for a high-grade completely enclosed automatically oiling engine for direct connection to rotary pumps, fans, blowers, etc. For this class of service it is frequently preferable to operate the engine under control of the throttle or with a limit-speed throttling governor. When this is the case it is often desirable to have a hand adjustment for varying the cut-off (illustrated herewith). We also similarly equip center crank engines when preferred.

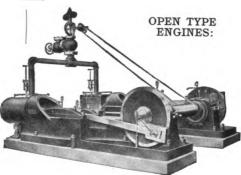
75

Sectional View

We build completely enclosed Automatically Oiling Engines with single cylinder in sizes up to 300 I. H. P. or in twin or cross compound styles, up to proportionately larger ratings. It will be noted that while all of the moving parts are readily accessible, yet even the valve gear is enclosed in such a way as to permit the bearings of the valve gear to be flooded with oil in the same manner as the other bearings are lubricated. Our line of enclosed engines includes the side crank style



Completely Enclosed, Automatically Oiling Engine with Throttling Governor. Hand Adjustment for Variable Cut-off Is Illustrated



Heavy Duty, Open Style Twin Engine with Throttling Governor

Open type engines of the side crank style are built by us with single cylinder with capacities up to 350 H. P. or with twin cylinders up to 700 H. P. We build open type engines both single and compound and equipped with either throttling or shaft governors. We build center crank open type engines up to about 100 H. P. The illustration shows a large size twin engine of about 500 I. H. P. Such

attachments as link motion, gearing, hoisting drums, etc., are frequently furnished by us.

INTERNATIONAL ENGRG. WORKS, INC.

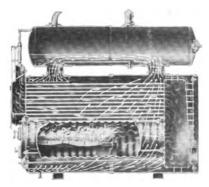
FRAMINGHAM, MASS. BRANCH OFFICES:

BOSTON, MASS. PHILADELPHIA, PA.

NEW YORK, N. Y. SAN FRANCISCO, CAL.

Boilers, Grates and Steel Plate Construction

BRADY SCOTCH BOILERS:



A well designed standard Scotch boiler shows the best all-round efficiency both for marine and stationary service.

Brady Scotch boilers include all the advantages of this class and show a rapid water circulation without a special pump or other device. This positive circulation is obtained by placing an annular ring or plate extending around the inside of the shell just below the front neck (see illustration). Unequal expansion is thus impossible because of the definite circulation from the bottom of the shell.

Internal Furnaces: No brickwork is necessary because of the internally fired furnace, hence no brickwork to try or maintain.

Radiation losses are practically elimi-

nated with a corresponding higher efficiency in heat transmission.

No decreased efficiency due to air leakage.

No heavy installation charge, merely pipe and flue connections.

Brady Scotch boilers are built in compliance with such requirements as



the A. S. M. E. Boiler Code, various state codes, Lloyd's Registry, British Board of Trade, etc.

VERTICAL TUBULAR BOILERS:

We build straight shell, tapered course and Manning types of vertical tubular boilers.

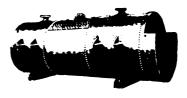
The Manning type is ideal for high pressure and large units. Especially recommended for turbine service as it can furnish steam superheated 25° to 50°.

As its construction permits of easy cleaning and inspection it is well suited for any

locality regardless of water conditions.

Remarkable evaporation obtained and no air infiltration loss. Less space occupied per horse power than other types.

HORIZONTAL RETURN TUBULAR BOILERS:



Constructed of the best materials according to the best practice in accordance with accepted boiler codes.

Furnished with standard brick setting or steel casings.

Heating surface, steam space and grate area liberally proportioned. They are safe, economical, simply designed and cost less per horse power than other types.

Made in units up to 350 h. p.

Special boilers of any size built for all conditions of service.



INTERNATIONAL ENGRG. WORKS, INC.

MACDONALD SHAKING GRATES:



The best shaking grates on the market because:

They have unrestricted air passages and a foolproof locking flat grate.

May be repaired or renewed inexpensively by replacing top sections only.

Design permits air opening or grate spacing to be changed at will. Designed for greatest strength in proportion to weight of material. Gives more perfect combustion, saves fuel and increases boiler capacity.

STEEL PLATE CONSTRUCTION:

The services of the most efficient and best equipped steel plate construction plant in the East are at your command for plate work of every description from our own designs or your specifications. Exceptional shipping facilities.

ENGINEERING SERVICES:

If you have a problem in boiler, grate or steel plate construction our engineering department will gladly aid you in solving it without obligation to you. Years of experience and an accumulation of valuable data place us in a position to be of service to you.

Let us know the conditions and designs; recommendations and estimates will be forwarded promptly.

DATA ON BRADY SCOTCH BOILERS

Number Horse power	Q.	ft.	Hea	ting sur	rface,	shell, in.	Tu	bes				boiler over line to top	outlet, in.	centers in
	Grate surface, sq.	Water heating	Superheating	Total	Diam., in., upper	Number, in.	Diam., in.	ft. Length in.	Feed pipe, in.	Blow-off pipe, in	ft. Height of boil all. Floor linin.	Size of smoke ou	ft. Distance on cer in. battery	
1 2 3	95 117 148	19.6 23.7 28.2	860 1057 1334	287 354 450	1147 1411 1784	50 56 62	120 148 188	$2\frac{1}{2}$ $2\frac{1}{2}$ $2\frac{1}{2}$ $2\frac{1}{2}$	15-0 15-0 15-0	$1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$ $1\frac{1}{2}$	2 2 2	23-6 23-11 24-4	30x16 33x18 36x20	6-10 7-4 7-10
4	183	33.1	1640	555	2195	68	232	21/2	15-0	11/2	2	24- 9	39x22	8-4
5	223	38.4	1998	680	2678	74 80	284 332	21/2	15-0 15-0	11/2	21/2	25- 4 25- 9	42x24	8-10
6	260	44.1	2329	795 938	3124 3682	86	392	21/2	15-0	2	21/2	25- 9 26- 2	45x26	9- 4 10- 0
6	307 350	50.2 56.7	2744 3131	1073	4204	92	448	21/2	15-0	2	21/2	26- 7	48x28 51x30	10- 6
8 9	408	63.6	3651	1255	4906	98	524	21/2	15-0	2	21/2	26-10	54x30	11- 0

DATA ON MANNING VERTICAL TUBULAR BOILERS

			S	hell	1	Furna	ace	bus	om- stion am- er	Tu	bes		D	rum	1	Vozz	les	Dim	ension all	over
Horsepower	Grate sq. ft.	Heating surface, sq. ft.	Diam., in.	ft. Length	Number	Diam., in	ft, Length	Diam., in.	Width, in.	Number	Diam., in.	ft. Length in.	Diam., in.	ft. Length	Number	Diam. openings, in.	Diam. flanges, in.	ft. Length	ft. Width	ft. Height founda- in. tion to steam outlet
50 75 100 125 150 200 250 300	26.25 31.25 42.0 52.5	450 643 812 1020 1214 1677 2082 2585	72 78 84 90 102 114	10-4 11-4 14-0 15-0 15-0 16-0 16-0 17-0	1 1 1 1 2 2 2	33 36 40 45 50 36 42 45	8-0 9-0 11-0 12-0 12-0 13-0 13-0 14-0	71 77 83 94	18 18 24 24 24 24 24 24 24	76 100 84 98 118 150 188 220	3 3 3 3	8-0 9-0 11-0 12-0 12-0 13-0 13-0 14-0	27 30 30 33 36 42 45 48	9-0 19-0 12-6 13-6 13-6 14-6 14-6 15-6	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	4 4 5 5 6 6 7 7	$\begin{array}{c} 10 \\ 10 \\ 11 \\ 11 \\ 12 \frac{1}{2} \\ 12 \frac{1}{2} \\ 14 \\ 14 \end{array}$		6-11 7- 5 7-11 9- 0 10- 0	$\begin{array}{c} 9-5 \\ 10-2 \\ 10-9 \\ 11-6 \\ 12-6 \\ 14-5 \\ 15-8 \\ 16-4 \end{array}$

E. KEELER COMPANY

Established 1884 WILLIAMSPORT, PA.

NEW YORK

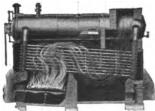
BOSTON BUFFALO

PHILADELPHIA PORTLAND, ORB. PITTSBURGH CLEVELAND CHICAGO

Manufacturers of Water Tube and Tubular Boilers. Steel Plate Work

KEELER WATER TUBE BOILERS:

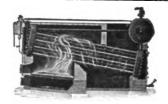
Standard Type: The arrangement of furnace, tubes, headers and drum in the Keeler Water Tube Boiler is efficient, accessible and compact. The superior efficiency of the Keeler Boiler rests upon correct proportions of heating and grate surface for the character of fuel to be burned, ample height of furnace, a su-perior arrangement of baffle walls and a perfect circulation. Every portion of the heating surface is accessible for both external and internal inspection, making it impossible for soot or scale to accumulate undetected. There is ample room between tubes and drum for inspection or repairs. Special patented side cleaning doors make it possible to observe the condition of the outside surface of the tubes. There is no part of the interior surface that cannot be examined and cleaned.



Standard Type Water Tube Boiler

Keeler Water Tube Boilers are usually built complete and tested in the shop. This reduces the cost of erection, as the boilers are handled as a unit. It also eliminates the dangers due to careless assembling of boilers in the field and makes the erection merely a matter of placing in position and attaching fittings. Built in units 75 to 1500 H. P.

Cross Drum Type: The Keeler Cross Drum Water Tube Boiler is a modification of the standard design, only in the length and location of the drum and the method of connecting it to the headers. This type was developed to meet the demand for a high pressure water tube boiler that could be installed in Office Buildings, School Houses, Churches, Apartment Houses, Hotels and boiler rooms generally where ceiling height is limited or where the boiler must be introduced through narrow passageway or restricted openings.



Cross Drum Type Water Tube Boiler

The pressure parts of the boiler are shipped in a knocked-down condition making it possible to install it without cutting through walls and floors in locations that would be wholly inaccessible for almost any other type of boiler. If boilers are to be exported, the cross drum boiler can be handled at much less expense by steamship companies on account of its reduced bulk in a knocked-down condition, and the comparatively small weight of the heaviest piece.

Built in units 60 to 1000 H. P.

KEELER HORIZONTAL RETURN TUBULAR BOILERS:

Our return Tubular Boiler is the product of fifty-six years' experience of boiler building. Tube holes are drilled from the solid plate, and not punched small and reamed to size. All seams are thoroughly caulked on the outside, and the end of butt straps are caulked on the inside. Braces are drop-forged. Steam



Horizontal Return Tubular Boiler

and safety valve outlets are provided with wrought steel connections of an approved type. Manhole plates, yokes and brackets are of pressed steel. All boilers built to A. S. M. E. requirements.

FIFTY-SIX YEARS OF BOILER BUILDING

Ask for Catalogs



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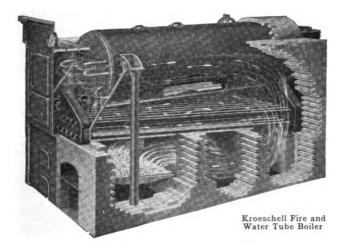
KROESCHELL BROS. CO.

Established 1879

460 WEST ERIE ST., CHICAGO, ILL.

TELEPHONE: Superior 8680-Private Exchange All Departments

Boiler Manufacturers, Heating and Power Contractors, General Plate Work, Steel Stacks, Breechings, Tanks, Feed Water Heaters, Crucible Furnaces (Oil and Gas), Ideal Chain Wrenches



79

THE KROESCHELL FIRE AND WATER TUBE BOILER:

Patented 1912

A highly efficient and convenient unit for medium capacities. Built in sizes from 100 to 300 Horse Power.

Long Fire Travel, Straight tubes.

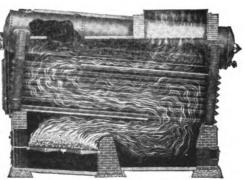
All parts readily accessible for cleaning and inspection.

Especially designed for large energy storage and rapid steaming to meet requirements of fluctuating loads. Maximum capacity for minimum floor space.

KROESCHELL WATER TUBE BOILER:

Built for heavy duty service. The excellence of design and construction of this boiler has been demonstrated by nearly forty years of successful operation.

Sizes 100-700 H. P.



Kroeschell Water Tube Boiler

THE GEORGE T. LADD COMPANY

GENERAL OFFICES

FIRST NATIONAL BANK BLDG., PITTSBURGH, PA.

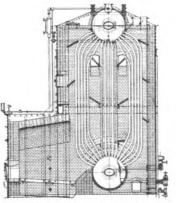
Manufacturers of the Ladd Water Tube Boiler

WATER THE BOILER

The Ladd Water Tube Boiler is a combination of rugged, simple and accessible construction. It has a clearly defined and unrestricted circulation, properly designed and proportioned gas passages and presents its entire heating surface in an efficient manner to the action of the hot gases. A corollary of the above is economical steam generation both from the standpoint of upkeep and fuel con-

sumption.

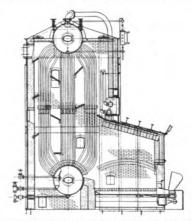
There is but one standard of construction: that of the A. S. M. E. Boiler Code. The drums provide for ample liberation area, and in the smallest boiler admit of ease in rolling of tubes or inspection. The tubes are all bent to a single radius, staggered to the passage of the gases and so arranged that any tube may be removed without disturbing others adjoining. No cast iron parts are used in the construction other than in connection with the brick setting, nor are there any flat or stayed surfaces. Access to the entire boiler is had through swinging manholes in the drums.



Hand Fired Arrangement

The Feed Water is introduced into a separate compartment in the lower drum and from there conducted upward at low velocity through the rear bank of tubes

where it is held in contact with the gases in the rear pass for a period of ten to twenty minutes depending on the rate of evaporation. This permits complete



Forced Draft Stoker and Superheater Application

sedimentation before the incoming water is brought into contact with the hot gases and insures a temperature practically equivalent to that of the steam before the water enters the circulation proper.

The circulation from this point on is positive and unrestricted, being directly down through the middle bank of tubes into the lower drum, thence upward in the front bank. At no point in the system of circulation is the combined cross sectional area of the tubes less at one point than at another.

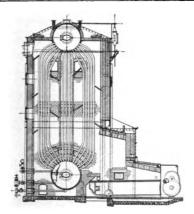
The boiler is suspended or swung in the furnace from heavy pin connections attached to the top drum which transmit

the entire weight of boiler and contents to a structural steel supporting frame. This frame lies outside of and flush with the brick setting and carries, beside the boiler, the superheater, all arch thrusts in the brickwork, the stack, if desired, and is available for the support of coal bunker, piping, walk-



81

THE GEORGE T. LADD COMPANY

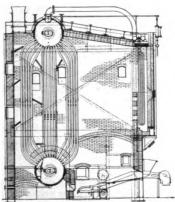


Chain Grate Stoker Application

ways, etc., or whatever is expedient to attach to the supporting frame. In the Dutch Oven type, the entire furnace is steel jacketed, the jacket being integral with the supporting frame. Where stokers are used, they are bolted to and held in place by this frame.

This type of suspension renders the brickwork free from all duty except that of insulation yet confines it so securely as to render it as air-tight as brickwork can be made.

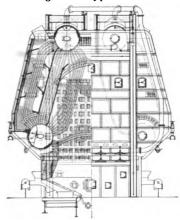
Particular attention has been paid to the baffling which has been worked out to most efficiently present the heating surface to the hot gases and at the same time prevent shrouding of the tube surfaces. Renewals are quickly and easily made and with reasonable attention, it is proof against short circuit of gases. It is of fire brick construction



Heavy Duty-High Arch Type

throughout, no metal binders or clamps being used in the high temperature zones and is tight and lasting for long periods. Any number of passes from two to five, inclusive, may be provided. The baffle system is so arranged that it can be inspected and every tile reached by the operator from some point within the boiler.

While it is impossible to standardize boiler furnace construction for all conditions and fuels, the furnace of most general interest is probably that for the burning of bituminous coal over forced draft stokers or powdered fuel. For such service, if the unit is to be subjected to high overloads, the Ladd Boiler is usually equipped with the high arch type of furnace. This



Multi-Drum Type

furnace promotes complete combustion, utilizes the radiant heat to the best advantage, renders the installation smokeless, and is easiest in the heat action on the tubes of any boiler furnace yet designed.

For very large units, the Ladd Multi-Drum Type offers all the furnace advantages of the high arch boiler with the additional feature of extremely small external radiating surfaces. The superheaters in this type may be carried in the end walls, thus rendering all four sides of the furnace heating surfaces from a point just above the stoker hoppers. This boiler can be made for either three or five pass gas travel.

In range of size, the Ladd boiler is built from the smallest practical water tube unit up to 1500 H. P. in the single type and to upward of 5000 H. P. in the Multi-Drum type.

Write for descriptive catalogue and list of prominent users.

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LEBANON

LEBANON BOILER WORKS

J. K. PETTY & CO., PROPRIETORS

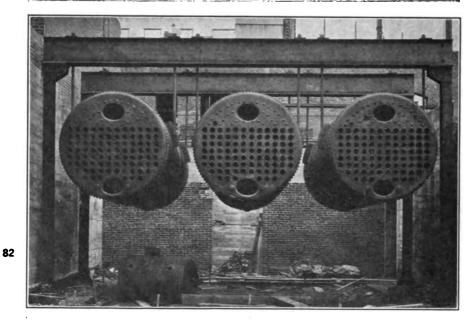
WORKS: LEBANON, PA.

SALES OFFICES

PHILADELPHIA NEW YORK

PITTSBURGH

CLEVELAND



Installation of Lebanon Boilers at Bethlehem High School, Bethlehem, Pa.

ESTABLISHED 1870

OUR POLICIES:

Fair Dealing Live and Loyal Service Good Workmanship

OUR PRODUCTS:

Boilers
Steel Stacks
Steel Tanks, all kinds
Riveted Piping
Breechings
Jacketed Kettles
Blast Furnaces
Water Gas Apparatus
Sugar Machinery
Acetylene Welding
Electric Welding
General Plate Work
Field Erection

LEBANON HORIZONTAL RETURN TUBULAR BOILERS are all built to the A. S. M. E. Code and Pennsylvania Standard.

They are carried in stock in 20 sizes from 50 horse power to 244 horse power. (One horse power is equivalent to 10 square feet of boiler heating surface.)

We will furnish and install for you Lebanon boilers complete, ready for operation; boiler, grates, setting and stack.

Lebanon boilers are guaranteed against defective material and workmanship for the life of the boiler.

Complete information is given in our specifications. Send for prices and specifications.

2 RECTOR ST., NEW YORK CITY

THE LUDLUM MARINE BOILER:

The Ludlum Boiler is essentially a marine boiler, designed and built for this specific purpose. It embodies all of the special features demanded in this class of work, including the greatest reliability, economy and steaming capacity, within the smallest limited space and weight.



Style "A" Three-drum Type Ludlum Marine Boiler

Simplicity:

It will be seen at a glance that the Ludlum Boiler is simplicity itself—no screw joints; no headers with their numerous handholes and packed or ground joints together with their restricted passages—no straight tubes anchored into immovable ends or headers with no chance for expansion. The Ludlum Boiler contains no castings; every part is of wrought steel.

Expansion and contraction take place freely in the Ludlum Boiler without straining any one part.

Safety:

The Ludlum Boiler is safest because every part is a true circle. There are no flat surfaces requiring numerous stay bolts and braces. There are no seams or riveted joints exposed to the fire, as they are all outside of the boiler casing, where they can always be observed.

Space Economy:

The Ludlum Boiler occupies less space per square foot of heating surface than any other marine boiler.

Accessibility:

It is a quick steamer, and steam can be raised in less than twenty minutes. The tubes can be cleaned on the inside, if necessary, by the usual methods. All parts of the boiler are accessible, and steam and water drum can be inspected simply by the removal of manhole covers.

Large Units for Rail Shipment:

The Ludlum Boiler can be supplied in larger single units than any other type, thus decreasing the number of boilers required. Moreover, this boiler is usually assembled and completed in our shop, and large units, having from 3000 to 4000 square feet of heating surface, can be readily shipped by rail. The Ludlum Boiler, being shipped in its completely assembled condition, is ready for lowering into the hold of the vessel when it arrives at destination. It is due to this fact that a large amount of time and money is saved. With most other boilers it is necessary that they be shipped knocked down, thus leaving the most important and expensive part of the work to be done in the hold of the vessel. Facilities are provided for attaching the lifting gear to the Ludlum Boiler so that it may be readily lowered into the hold.

This boiler, owing to its large combustion chamber, is adapted to burning coal, oil or wood, equally as well.

This type of boiler has been used in the United States Navy, and has fully demonstrated all of our claims.

The Ludlum Boiler is built in two types, namely, the two-drum and the three-drum. It is readily adaptable to the limited conditions usually encountered in marine work, and it can be varied in detail to meet the most exacting requirements.

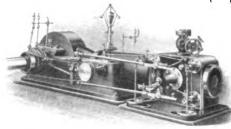
Bulletin on application.

MURRAY IRON WORKS CO.

BURLINGTON, IOWA

Complete Power Plants-Corliss Engines-Boilers of All Types-Air Compressors, Pumping Engines, Feed Water Heaters, Rocking Grates

MURRAY CORLISS ENGINES are built either with girder frame, tangye frames or rolling mill frames of our patented design. Ask for Catalogue No. 85.



Murray Rolling Mill Type Corliss Engine

The Standard Murray Corliss is a girder frame engine built in sizes up to 18 x 42 inches, and capacities ranging from 50 to 600 H. P.

Murray Tangye Frame Corliss Engines for extra heavy duty are built in sizes from 16 x 36 inches upward.

84

Our Rolling Mill Type Frame for high pressures and high speeds is built for engines from 12 x 24 inches upwards. Capacities range from 100 to 1300 H. P. Tandem and Cross Compound Engines are built for any load required.

Murray Minor Corliss Engines, 20 to 70 H. P., are suitable for the smaller mills and factories

Points of Superiority:

- A. Excellence of materials.
- B. Best workmanship. Rigid inspection.

- C. Rigid inspection.
 D. Superiority of design in the following particulars of detail:
 1. The latest and most approved forms of frames, suitable for every purpose.
 2. High speed, ball-bearing governor with improved safety stops.
 3. A form of cylinder whereby the exhaust passages are insulated from the cylinder by a dead air space.
- dead air space.

 4. Improved valve motion.

 5. Improved dash pots, under the cylinder plate, or bolted to side of cylinder.

 6. Improved forms of steam and exhaust
- 6. Improved forms of steam and exhaust alves. (Double ported when specified.)
 7. An improved form of piston.
 8. Fly wheels made in halves, free from
- initial strains

9. Vertically adjustable outer pillow block with oil-retaining rim.

10. Broad, pyramidal main bearing and cylinder feet or sole plates.

11. New and improved style connecting rod.
12. Improved cross head with adjustable

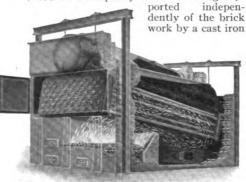
Improved cross head with adjustable shoes running in bored guides.

13. Smallest possible clearance volume.

HIGH PRESSURE MURRAY BOILERS:

The essential features of the Murray Water Tube Boilers are safety, simplicity, accessibility and economy of fuel and space. They are of the straight tube, all steel type, no cast iron being used in any part subject to tensile strain. They

are made up of front and rear headers connected together with wrought circulating tubes and a top steam drum or drums, the whole set with an incline to the rear in an inexpensive brick setting, those of 200 H. P. capacity and over being sup-



Murray Water Tube Boiler with Suspension Rigging

column and steel girder gallows frame as shown.

We do not confine our customers to one type, but build the Tubular, the Water Tube and the Internal Furnace. These different types of boilers are described in the following: Water Tube—Catalogue No. 60; High Pressure Horizontal Tubular, Standard Horizontal Tubular, Vertical and Portable, Catalogue No. 90; "Duplex," Catalogue No. 75.

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MURRAY IRON WORKS CO.

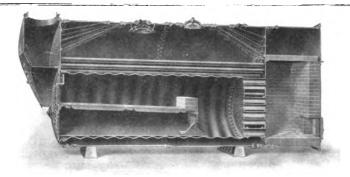


Fig. I

MURRAY DUPLEX INTERNALLY FIRED BOILERS:

A Different Principle of Circulation

The special feature of the Murray "DUPLEX" boiler is covered by letters patent No. 1,151,127 and this improved form of construction can only be used by the Murray Iron Works Company. The "Scotch" boiler as built heretofore, while nearly the ideal boiler for economy of fuel and space, had one decided weakness, namely, poor and unequal circulation. Owing to the location of the flues and the furnace the heat travels as shown in Fig. 2, and the lower part of the boiler is always cold, so cold, in fact, that in many cases you can safely put your bare hand on the bottom of the shell because all the heat of the fire is transmitted to the water in the upper half of the boiler.

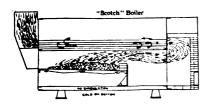


Fig. 2

This unequal heating has two serious drawbacks: first, the water in the lower part of the boiler being dead, only that above the furnace is in circulation, thus materially cutting down the capacity and

efficiency of the boiler; second, the extreme difference in temperature between the top and the lower part of the boiler generally causes it to leak in the girth seam.

Fig. 2 correctly represents the fire travel and water circulation in the ordinary types of "Scotch" boilers.

In the Murray "DUPLEX" boiler the circulation is similar to that in an externally fired boiler. Our boiler becomes hot all over setting up a rapid circulation and overcoming all unequal expansion and contraction in the shell and furnace. You would need an asbestos mitten for safety if you placed your hand anywhere on the bottom of our boiler. Note the difference in circulation between a "Scotch" boiler and the Murray "DUPLEX" boiler as shown by Figs. 2 and 3.

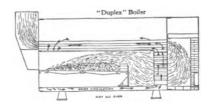


Fig. 3

"DUPLEX" Internally Fired Boilers are built in sizes of 50, 75, 100, 125, 150 200 and 250 H. P.

These Boilers Are Practically Smokeless.

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OIL CITY BOILER WORKS

MAIN OFFICE AND WORKS: OIL CITY, PA.

EASTERN DISTRICT BRANCH: Astor Trust Bldg., Fifth Ave. & 42nd St., New York City WESTERN DISTRICT BRANCH: Marquette Bldg., Dearborn St., Chicago PITTSBURGH BRANCH: 1112 House Bldg., Pittsburgh, Pa.

PRODUCTS:

Geary Water Tube Boilers, standard

Geary Water Tube Boilers, Cross Orum type.

Drum type.
"Oil City" Heating Boilers, Portable
Fire Box type.

Fire Box type.
"Oil City" Heating Boilers, Portable
Smokeless Fire Box type.

"Oil City" Heating Boilers, Brick Set type.

Horizontal and Vertical Tubular Boilers.

After many years' experience in the manufacture of boilers of various types, the Oil City Boiler Works in 1893, recognizing the increasing demand for economy, capacity and, above all, safety under high pressures, designed and placed upon the market the GEARY WATER TUBE BOILER, the original of the box header or water leg type, built with inclined tubes and horizontal drums.

The design of the Geary Boiler, after a record of twenty-seven years for economy and durability, remains the same. Improvements in details, however, have been made from time to time to meet the advanced requirements in boiler construction

THE GEARY WATER TUBE BOILER:

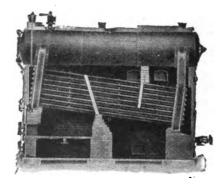
Consists of a bank of straight tubes, expanded at each end into wrought steel headers of box shape, strongly braced and stayed. The tubes are inclined, and the back header is made longer than the front, so that the drum or drums connecting the two headers lie level.

Circulation: The connection of the headers with the drum is made so as to provide large throat areas. There is no obstruction or contraction of area in the course of the circulation. The water flows quietly and steadily, carrying with it the bubbles of steam from the tubes into the front header, the inclination of the tubes aiding this and preventing the steam lodging in the tubes and forcing the water out with a geyser-like action.

On top of the drum, centrally located, is placed a pressed steel flange for main steam outlet. Inside of this outlet is fitted a perforated Dry Pipe. This arrangement eliminates the use of any internal baffles or deflecting plates.

Numerous tests of Geary Water Tube Boiler installations—many under heavy overload conditions—show the entrained moisture in the steam to be less than 1 per cent.

Setting: When set the Geary Boiler is suspended at the front end from heavy overhead cross channels or beams by a heavy wrought iron loop bolt placed under the drum in front of the header and out of the path of the gases. The overhead channels or beams rest on top of steel upright columns which extend down to the foundations resting on heavy cast iron base plates. The uprights are placed at the extreme outside of the setting and removed from the heat of the furnace.



Longitudinal Section of Vertically Baffled Boiler

The rear header of the boiler rests on rollers, which in turn bear on heavy cast iron plates, firmly supported by the brick work of the substantial low rear wall of the setting or upon supporting stands. This method of supporting the boiler independent of the setting permits it to expand and contract without injury to the setting walls.

Sizes: The Geary Boiler is built in a range of sizes from 30 to 1100 Horse Power, and many sizes about the same capacity, but of different dimensions, to meet the varied conditions of space, draft, fuel, furnaces and transportation, making it possible to select the proper size to meet the requirements and conditions governing any particular installation.

Units up to 420 H. P. are usually built up complete and thoroughly tested before shipment. Units of 500 H. P. and larger are shipped "knocked down."

PAGE BOILER COMPANY

GENERAL OFFICES:

817 LARRABEE St., CHICAGO, ILL., U. S. A.

Manufacturers of Water Tube Sectional Steam Boilers

PAGE WATER TUBE SECTIONAL BOILERS:

Greater Boiler Capacity in Less Space

Where high capacity is essential and space is limited, the Page Water Tube Boiler is the ideal steam generator. In construction it is actually two boilers in one; with practically twice the steaming capacity of an ordinary type of boiler of equal size.

The sectional drawing below plainly shows the arrangement of the tube sections which are added to, according to the H. P. desired. Unlike other types of boilers, the Page is a complete self-contained unit, supported by its own steel structure and casings. No brick settings are employed, so that air leakage and heat losses are unknown in Page-equipped plants.

SPECIFICATIONS:

Working pressure up to 300 lbs. (standard construction).

Boilers up to 500 H. P. delivered in sections through an opening 4 ft. by 8 ft.

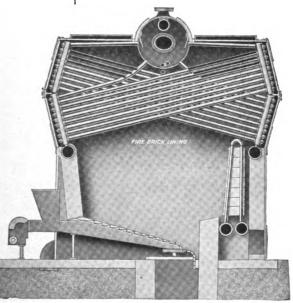
Equipped with an efficient soot blower; no doors to open when blower is operated.

Requires from 25% to 30% less draft than boilers with several passes, but attains highest efficiency in its one and only pass.

Adapted to all types of furnaces and stokers, or may be hand fired.

Load fluctuations are provided for by a feed water regulator; standard equipment.

Note the generous combustion chamber and the absence of "baffles," as the term is usually used. The Page is a single pass boiler and attains highest efficiency in one pass because the tubes are short and small-3 inches in diameter for all οf boilers—consequently square inch is constantly active. Scaleforming material and precipitation drop through the lower header into the mud drum where there is no circulation; from there, it is blown out through the blowoff valves. The distance of water travel when passing through the steam drum from one section to another is but 13 inches, as compared with 18 feet of travel in standard and horizontal water tube boilers. Since the tubes are all straight, scale can be quickly removed by turbining. Read the specifications opposite, and send for the Page catalog explaining the many distinctive Page features in detail.



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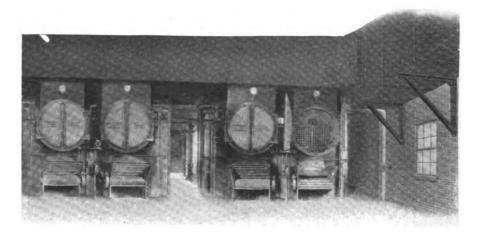
SAMUEL SMITH & SON COMPANY

PATERSON, N. J., U. S. A.

Established 1844

Cable "Samsmith"

Manufacturers of Horizontal Return Tubular and Smith Vertical Tubular Boilers



88

HORIZONTAL RETURN TUBULAR

AND

SMITH VERTICAL TUBULAR

BOILERS

Built to A. S. M. E. Code Standard or to

State Codes

We also Build:

Tanks

Kiers

Vulcanizers

Steam Boxes

Stacks

Smoke Breechings

and other plate work of a similar character. | tions established.

A Stock of-

Tubes

Grate Bars

and

Boiler Fittings

is carried for immediate shipment.

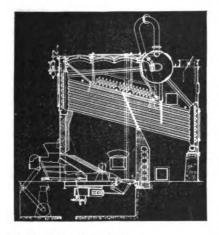
Our Engineering Department is at your service. It is our policy to give the best advice that our long experience and study make possible, regardless of its immediate effect upon our manufacturing and sales, believing that in this way only are mutually profitable relations established.

SPRINGFIELD BOILER CO.

SPRINGFIELD, ILL.

Builders of "Springfield" Boilers

"SPRINGFIELD" WATER TUBE BOILERS:



Sectional-Sinuous Headers

NO Staybolts

NO Braces

NO Bent Tubes

ALL STEEL Construction

Illustration shows a complete section of the "Springfield" Water Tube Boiler in place, with the front header suspended and the rear resting on a ball bearing. This construction allows the header to come and go from any direction, relieves it from all strain, and does away with the wear and tear that is sure to follow in a boiler where the joints are rigid. The front headers hang from suspension rods. There are no riveted seams where the header is connected to the drum, as in water-leg boilers.

The 3-inch tubes are pitched at an angle of 15 degrees. This gives rapid and perfect circulation. They are in groups of four, with one *hand-hole* to each group. Two-thirds less hand-holes than in other



horizontal water tube boilers; this greatly facilitates and lessens cost of cleaning. Hand-holes have inside steel plates.

Each section is connected to the steam and water drum by four tubes; this gives very large liberating area, evenly distributed over the entire length of the drum. This insures perfect circulation. Drum of large diameter and special dry pipe insures dry steam.

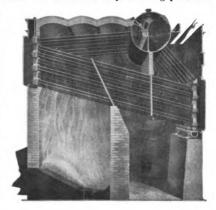
Baffles are made of cast iron, with open face and cast iron sleeves, through which the tubes pass. They are filled with refractory material, are held in place by flame bars, and form a solid wall. They are indestructible. Permit removal of any tube without disturbing other tubes or baffles.

Tubes are staggered in such a way as to allow the gases to completely surround them. This allows a thorough mixture of the gases of combustion.

Low escaping gases.

Boiler is very compact; occupies less space than other boilers of like capacity and requires less brick for its setting; approximately 97 per cent of the total heating surface is *in the tubes*.

Built in all sizes from 150 H. P. to 2000 H. P. and for any working pressure.



Write for pamphlets, catalogues and further data on "Springfield" Water Tube Boilers.



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THE UNIFLOW BOILER CO.

GENERAL OFFICES: PHILADELPHIA, PA.

CLEVELAND COLUMBUS KAN

ND PITTSBURGH Kansas City Omaha MEMPHIS ROCHESTER
GRAND RAPIDS, MICH.

NEW ORLEANS
SIOUX CITY CHICAGO

THE UNIFLOW BOILER:



The Uniflow return tubular boiler has been designed and built to meet the present demands for the economical generation of steam. In addition to the advantages of durability, simplicity and low maintenance cost which many years of service of this type of boiler have proven beyond doubt, the Uniflow Boiler is noted for:

- 1. High operating efficiency.
- 2. Increased rate of heat transfer.
- 3. Positive rapid circulation.
- 4. Great steam disengaging area.
- 5. Delivery of dry steam.
- 6. Great overload capacity.
- 7. Compactness.
- 8. Cleanliness of heating surface.
- 9. Reduction of setting losses and upkeep cost.
 - 10. Complete, efficient combustion.

Efficiency: The patented tube layout in the Uniflow Boiler equalizes as much as possible the proportion of the gas area to the water content of the Boiler. A most efficient and rapid transfer of heat, therefore, is obtained. The circulation paths in the Uniflow Boiler provide a positive unobstructed circulation of water in the boiler. The steam quickly generated as the result of this efficient heat transfer and positive circulation

rises rapidly to the steam space in the boiler. On entering into the steam space, the steam passes through the large disengaging area. By providing a large disengaging area for the steam, the dangers of priming at overload periods is entirely overcome. The regular guarantee specifies that the Uniflow will develop an efficiency of 74% and operate at 150% of rating without priming.

The ability of the Uniflow Boiler to generate steam quickly, and pick up heavy overloads quickly has been demonstrated by installations in many plants. In every case the Uniflow Boiler has been able to meet the demand for steam quickly without loss in steam pressure. It has been said by many engineers that the quick steaming feature of the Uniflow excels even the water tube type of boiler.

Smokeless Combustion: The Uniflow Furnace constructed in every case under the Uniflow Boiler enables the Uniflow to consume bituminous coal as fuel with the smoke emission from the boiler at all times being within the limits of smoke formation as provided by the Local Smoke Bureau.

The compactness of the Uniflow Boiler compares very closely to the compactness of the water tube boiler. In some cases the floor space and head room required by the Uniflow Boiler is considerably less than that of the water tube. In comparison with the return tubular type, the Uniflow contains approximately 50% more heating surface in a given size shell. That is, the usual 72" x 18' return tubular boiler has a nominal rating of 150 horsepower and actually contains 1420 square feet of heating surface. The Uniflow Boiler of the same size contains 52% additional capacity, or 2160 square feet of heating surface, developing 216 horsepower as its nominal rating. A further advantage in the compactness is that the radiation losses from the boiler setting are very much less than the radiation losses in other types of boilers.

More efficient boilers represent the one logical solution of the high fuel cost and fuel shortage problems. The coal saving is actual and proved in practices, and not merely a theory in Uniflow Boiler.

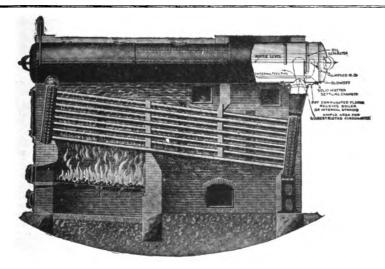
Built in 33 standard sizes—prompt shipments.

UNION IRON WORKS

ERIE, PA.

Manufacturers of Steel Boilers

Branch Offices and Representatives in Boston, New York, Philadelphia, Syracuse, Buffalo, Cleveland, Pittsburgh, Toledo, Detroit, Chicago, St. Louis, Kansas City and San Francisco



The Union Iron Works have been builders of steel high pressure steam boilers for nearly 30 years in Erie. From a modest start we today cover about six acres with buildings consisting of main boiler shop, flange shop, blacksmith shop, machine and casting shop, stack and tank shop. All of these buildings are equipped with modern facilities. See feature No. 7. Our motto "Quality" accounts for our growth and development.

No effort is spared to keep the product up to and ahead of the times if possible by an expert engineering staff.

THE "UNION" WATER TUBE BOILER:

- 1. Horizontal drums—liberating surface, dry steam, water storage capacity.
- 2. Purifier in drums, settling chamber out of fire and circulating element, oil trap, provided with blow-off connection. Additional blow-off bottom of headers.
- 3. Corrugated flange connection from drums to headers, no restricted area, good circulation, relieving boiler of internal strains.
- 4. Headers made in integral halves in one heat, of ample depth, no double plates

or rivets exposed to fire, regular, not irregular, pitch of staybolts.

- 5. Handhole plates of steel plate, each removable through hole it covers, no fishing, yoke of novel design, quickly removed. Special shape of hand-hole, easily kept tight.
- 6. Greater inclination of tubes promoting circulation, vertically staggered, horizontal spacing to permit proper cleaning on fire side. Ample gas passage areas.
- 7. The very best workmanship that can be done by a well-trained organization.
- 8. Continued operating efficiency and greater overload capacity than any other boiler, due to the combination of these features, resulting in less time required to clean boiler when necessary, longer period of continued efficient operation, minimum loss of time out of service.

We also build a complete line of Fire Tube Boilers and do steel plate work.

Condensed specifications and engineering data specially prepared for consulting and designing engineers, free on request.



HENRY VOGT MACHINE CO.

GENERAL OFFICE AND WORKS LOUISVILLE, KY., U. S. A.

Manufacturers of Ice and Refrigerating Machinery, Water Tube and Horizontal Return Tubular Boilers, Sectional Steel Boiler Casings, Drop Forged Steel Valves and Fittings, Oil Refinery Equipment, Paraffine Wax Presses, Distillate Chilling Machines for Cold Test Oils, Welded Vessels, Sectional Rocking and Dumping Grates

REFRIGERATION:

Forty years of effort in the design and construction of the Vogt Absorption Machine have brought forth the present economical and efficient Exhaust Steam unit. By an exhaust steam unit is meant a refrigerating machine capable of developing its rated capacity through the use of steam that has already performed useful work.

A further economy is effected by combining the exhaust steam refrigerating machine with any mill, light or power plant, the refrigeration or ice so produced being virtually a by-product. When it is understood that the operation of such a machine is possible without the introduction of any complicated parts, our correctness of design is thoroughly established.

The workmanship and materials used on our machines are the very best, our drop forged valves and fittings being one of the superior features.

VOGT EXHAUST STEAM AMMONIA GENERATOR (Patented):

Designed to operate on the lowest possible steam pressure.

The shell and heads are made of semi-



steel, this metal being the most durable in contact with hot ammonia.

The coil is made of straight extra heavy wrought iron pipe, and each pipe is closed at one end. The steam is delivered through an inside pipe at the closed end and travels only one time the length of the Generator. This eliminates friction and enables operation at minimum pressure.

Other special features are:

| Return Bends | Bent Pipes |
| NO Exposed Heating Surface |
| Stuffing Boxes on Steam Coils |
| Threaded Joints inside of Shell

VOGT AQUA AMMONIA PUMP:

The Vogt Aqua Ammonia Pump is designed to handle strong aqua ammonia. The steam cylinder is equipped with balanced piston type valve, gov-



erned by an auxiliary valve which is mechanically operated. The steam consumption is exceedingly low for this type pump and the speed is automatically controlled at any desired number of strokes by means of a Mason Regulator. The ammonia cylinder is provided with an extra long stuffing box and water chamber.

The ammonia piston rod is made of special steel and connected with coupling to the steam piston rod so it can be easily removed when necessary.

The pump is mounted on a heavy subbase.

DROP FORGED VALVES AND FITTINGS:

The purchase of low grade valves and fittings is false economy. The one consideration that should govern the choice of valves and fittings is their permanent value—not their first cost factor. The purchaser who overlooks this wide difference between value and price, overlooks the inevitable losses through leaks and breakage which are invariably in excess of the money originally saved.

Vogt forged valves and fittings are in daily service, frequently subjected to intense pressures which no other fitting but a Vogt could withstand. They are especially adapted for high pressures of air, steam, gas, ammonia, water and oil. For the manufacturer of chemicals, of explosives, of hydraulic equipment; for the factory, the mill and the mine these fittings are no experiment—they are a daily necessity.



With a record of excellent service and a guarantee of satisfaction Vogt forged valves and fittings are the logical selection—there can be no reason for not specifying them.

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HENRY VOGT MACHINE CO.

THE VOGT WATER TUBE BOILER:



The exacting requirements of the modern Power Plant are satisfied by Vogt Water Tube Boilers.

Continuous high economy is obtained, due to the design of the boilers and the arrangement of the furnaces for the proper combustion of the fuel.

Low cost of maintenance is secured by the elimination of numerous handholes at ends of tubes and by the accessibility for cleaning and inspection, also by the flexibility of construction, effected by the method of suspension which allows for the freedom of expansion and contraction.

High grade workmanship and material is embodied with the most advanced boiler practice, which complies fully with the new A. S. M. E. Boiler Code.

THE VOGT HORIZONTAL RETURN TUBULAR BOILER:



Vogt Horizontal Return Tubular Boilers are constructed in accordance with the new A. S. M. E. Boiler Code for 125 and 150 pounds working pressure and range in capacity from 45 to 250 horse power.

The equipment is arranged to assure ample space between the grates and the bottom of the boiler, also a large combustion area in rear of bridge wall, thus meeting the present-day demand for economical fuel consumption.

THE VOGT SECTIONAL STEEL BOILER CASING:



The necessity that more perfect combustion be obtained has made the elimination of the excess air which leaks through brick boiler settings one of the most important features of boiler setting design.

The Vogt Steel Casing for Return Tubular and Water Tube Boilers constitutes a decided step towards securing this more perfect combustion, as it avoids all leaks common to brick settings.

A considerable saving in the cost of maintenance and in the elimination of expensive delays is effected since the brick lining of the Steel Casing (being tightly sealed) is not subject to the usual expansion and contraction.

Excess air means wasted fuel. Stopping the leaks reduces the coal consumption. Coal saved is Dollars saved, which is a direct return upon the investment.

THE VOGT SECTIONAL SHAKING AND DUMPING GRATE:



The Vogt Sectional Shaking and Dumping Grate,

will save you fuel;
will cost you less for maintenance;
will increase the efficiency of your boilers;
will reduce your fireman's labors.

Illustrated Bulletins containing detail description of our products will gladly be sent you upon request.



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THE WALSH & WEIDNER BOILER CO.

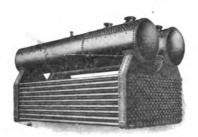
FACTORY AND GENERAL OFFICES

CHATTANOOGA, TENN.

BRANCH SALES OFFICES:-New York-New Orleans-Memphis-Havana

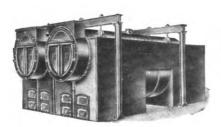
Manufacturers of Boilers, Tanks and Towers, Storage Tanks, Structural Steel and Steel Plate Work of Any Description

HORIZONTAL RETURN TUBULAR AND WATER TUBE BOILERS:



With or without steel casing setting.

Special furnaces for all kinds of fuels or refuse materials.



The steel casing setting may be used either with tubular or water tube boilers and is of great value in preventing infiltration of air into the furnace—thus saving considerable fuel as compared with boilers set in the ordinary brick setting.

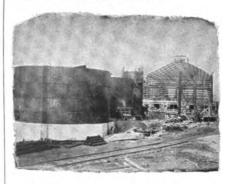
The steel casing setting is neat looking, occupies less space than the brick setting, and the cost of installation is not materially greater.

TOWERS AND TANKS:



Pressure and storage tanks, steel riveted piping and other work for by-products plants, chemical plants and all kinds of industrial work. Oil storage tanks, stills and agitators. Sugar crystallizers and defecators.

PLATE IRON WORK: STRUCTURAL MATERIAL:



All kinds of special plate iron and structural work.

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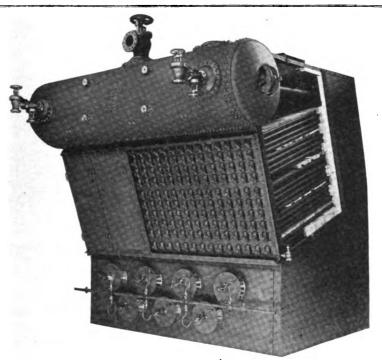
THE CHARLES WARD ENGINEERING WORKS

CHARLESTON, W. VA.

EASTERN AGENT
KEARPOTT ENGINEERING Co., INC.
95 Liberty St., New York City

PACIFIC COAST AGENT
McKinlay Engineering Bureau
Chamber of Commerce Building
Portland, Oregon

Manufacturers of Water Tube Boilers and Marine Engines



WARD'S WROUGHT STEEL MARINE BOILER:

Improved and Most Rapid Circulation.

Generating Tubes Expanded.

No Other Joints.

No Nipple Connections.

No Staybolts.



Illustration shows Ward Boiler of 4275 Square Feet Heating Surface.

Contracts Awarded as Result of Evaporative Trials.

16.73 Pounds Water per Pound of Oil.

81.68 Per Cent Efficiency.

Built in 80 standard sizes, ranging from 1700 to 5000 S. F. H. S.

Especially for Marine and Stationary Work where Highest Efficiency is required.

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THE WICKES BOILER COMPANY

SAGINAW, MICHIGAN

Manufacturers of Vertical Water Tube Boilers

SALES OFFICES

NEW YORK CITY, 1716 West St. Bldg. BOSTON, 201 Devonshire St. SEATTLE, 736 Henry Bldg.

PITTSBURGH, 1218 Empire Bldg. DETROIT, 1116 Penobscot Bldg. CHICAGO, 76 W. Monroe St.

PRODUCT:

Wickes Vertical Water
Tube Boilers Stands
and Steel Erect
Cased Boiler CleanSettings.

DESCRIP-TION:

Designed and built in accordance with the A. S. M. E. Boiler Code.

Built of homogeneous metal. No

96

cast metal of any kind used.
All tubes perfectly straight.

Very highest class workmanship known to the art put upon these boilers.

No special parts used. Material can be furnished and boiler repaired by local boiler maker.

Baffle tile is heavy, rabbeted, tongued and grooved and cannot be misplaced.

Easiest boiler to open, wash or turbine and close on the market. Hence, can be operating the maximum number of hours per year.

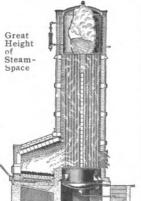
Accessible mud drum located at the lowest point of the boiler.

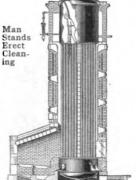
Gases have a very long travel; entirely

surround and scrub heating surface from entrance to release.

There are no passages in setting not filled with heating surface. No opportunity exists for gases to short-circuit heating surface.

Precipitation of soot and impuri-





ties in water are taken advantage of by gravity to the fullest possible extent.

Steel cased settings stop air leaks and so increase efficiency.

Great height of steam outlet from water level, coupled with liberal steam storage capacity, results in absolutely drylsteam being delivered by this boiler.



Steel Cased Setting

BULLETINS:

Ask for Educational, Technical Bulletins, illustrated with Wickes Vertical Water Tube Boilers. These Bulletins are free while they last and are:

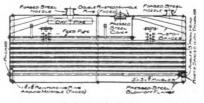
Reducing Costs in the Boiler Room.

The Magnitude and Prevention of Air Infiltration Losses.

Saving Coal in Steam Power Plants.

Aids in the Selection of a Steam Boiler with a Peep at the Wickes Vertical Water Tube Boiler.

HORIZONTAL RETURN TUBULAR BOILERS:



A. S. M. E. Code Return Tubular Boilers

Ask for Catalogue covering design and workmanship.

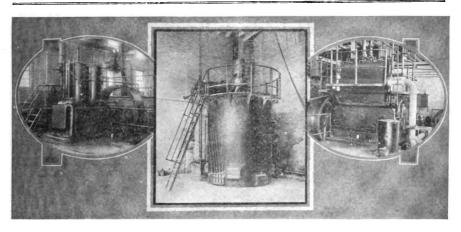


GAS PRODUCER AND ENGINEERING CORPORATION

OF NEW JERSEY

MAIN OFFICE: 15 PARK ROW, NEW YORK, U. S. A.

Manufacturers of Galusha Stationary and Marine Gas Producers Complete Power and Gas Plants



Galusha Suction Type Gas Producer for Either Power or Fuel Gas as Desired

97

COMPLETE GAS PLANTS, POWER AND FUEL GAS FOR,

Plate Bending, Flanging and Drawing

For Shipyards

Solder Baths

Melting Bronze or Brass

Tempering

Annealing Muffles

Tinning

Heating Linotype Pots

Galvanizing Baths

Spelter Furnaces

Soldering Irons

Annealing Wire and Sheet Metal

Distilling

Drying Moulds in Foundry

Lead Pots

Tubes in Muffles

Drop Forging and Reheating Furnaces

Blacksmith Forges

Rivet Heating

Furnace Work of all Kinds

Melting Glass in Tank or Pot Furnaces Lehrs

Evaporating

Electro-Chemical Work

Singeing Cloth

Calendering

Bake Ovens

Coffee Roasting

Core Ovens

Roasting and Calcining Ores

Enameling Ovens

Heating Dye Rooms

Annealing

Firing Kilns For Potteries

Japanning Ovens

Lethage Furnaces

Ice Cream Cone Automatic Machines

For Heating Kettles

Descriptive Bulletins on Application.

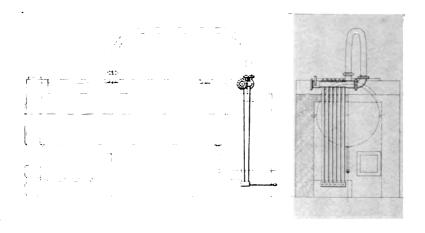
DRAVO COMPANY

2918-22 Burleigh Street

1290-98 Thirtieth Street

MILWAUKEE, WISCONSIN

Manufacturers of Superheaters and Power Plant Equipment



98

Showing Dravo Superheater in H. R. T. Boiler

As the day for superheating steam has arrived good apparatus for obtaining superheat has been developed in **DRAVO SUPERHEATERS**.

They are built for ruggedness and are designed for simplicity, accessibility and efficiency.

With the increased use of mechanical stoking, boilers are called upon for greater production and superheaters must keep pace with the boilers. The larger apparatus required will, of necessity, occupy more space within the boiler settings which, taken in connection with the greater volume of gases generated, means interference with the draft. The

open nesting of tubes in our apparatus reduces this interference to a minimum.

Dravo Superheaters are arranged for use in connection with different types of boilers and also for separate firing.

We solicit correspondence from designers of power plants and owners, especially of existing plants, where the use of superheat can make a splendid showing.

Six years of service and a goodly number of installations have proven the value of our apparatus.

NEW YORK

CHICAGO

Designing Engineers and Manufacturers of Steam Superheaters for all Purposes

LOCOMOTIVE SUPERHEATER CO.

SUPERHEATERS FOR STATIONARY POWER PLANTS:

Introduction:

Years of experience in the design and manufacture of steam superheaters has indicated a number of essential points connected with their design, construction and operation.

General Description:

The superheater consists in general of two headers, one acting as distribution



Fig. I

for the saturated steam coming from the boiler and the other a "superheated'' header for the collec-tion of the steam after it has been superheated, and the necessary connecting units in which the

actual superheating takes place. typical arrangement is shown in Fig. 1.

The headers are made of steel throughout, and are located entirely outside of the path of the hot gas, and in most de-



Fig. 2

signs entirely outside of the boiler setting. This design makes possible accessibility for inspection without entering the boiler setting. Fig. 2 gives a good idea of the general design of the header.

Units:

Units are made of heavy, cold drawn seamless tubing of the proper diameter to give correct steam areas. The tube presents a smooth surface offering a minimum of resistance to the flow of the gases and avoids serious collections of soot. This construction also brings



Fig. 3

the steam into intimate contact with the gas touched heating surface, and gives a low resistance to the flow of heat from the gases to the steam. The form of unit permits free expansion and contraction of all parts. Fig. 3 shows a set of superheater units ready for application to header.

The connection of the units to the header is made through a metal to metal ground joint. This joint is designed to permit easy removal of the units. Any unit may be removed without disturbing any other unit. This is the only metal to metal joint that has withstood the extremely hard service of locomotive opera-



Fig. 4 shows ball end of unit pipe with a clamp bolt and washer used in attaching to header.

Advantages and Adaptability:

These superheaters are suitable for application to all types of boilers. provide maximum superheating efficiency and capacity and maximum combined effi y of the superheater and the boiler, as w.l as uniformity of superheating effect. Their design and construction provide freedom from leaks, ease of application, accessibility for inspection or repairs, and maximum length of service; maximum superheat obtainable. OURABYTE IN MECHANICAL

These superheaters accomplish more in power plant fuel economy than any other single factor.

Send for Bulletin. Our Engineers Will Work with You.

ENGINEERING

GLASGOW IRON COMPANY

POTTSTOWN, PENNA.

PHILADELPHIA 603 Harrison Bldg. 15th & Market Sts. NEW YORK
D. F. Cooney & Co.
88 Washington St.

BOSTON HARRINGTON, ROBINSON & Co Sargent Bldg.

Manufacturers of All Grades of Iron and Steel Plates

FLANGED and DISHED BOILER HEADS.

Flanged Manholes— Handholes and Flueholes.

ROE STAMPED STEEL MANHEAD and YOKE.

Standard and Heavy
Threaded Pipe Flanges.
Companion Flanges—Off
Center Pipe Flanges.

100

MANHOLE SADDLES.

BUCKLED PLATES.

ROE BOILER LUGS.

Rectangular Flanged Heads.

WELDING AND CUTTING with the OXY-ACETYLENE TORCH.

Pressed Steel HOT BLAST VALVES and VALVE SEATS, Patented.

BOSH COOLING PLATES— TUYERE COOLERS.

FORMING, CUTTING OUT, PUNCHING and BENDING Plate to order.

Bending and Forming ANGLES and SHAPES.

The GLASGOW FLAT FLANGES for Riveted Pipe.

Pressed from Steel Plate—For Any Service.

Made PLAIN or BORED, FACED, HUB BEVELLED, DRILLED, to order. Any thickness of plate. 6 ins. to 72 ins. INSIDE DIAMETER.

These FLANGES, made with wide flanges, make Excellent Expansion Joints for Pipe Lines.

Many shapes formerly made in expensive Bronze Castings can now be made from Steel Plate by Press Work in combination with AUTOGENOUS WELD-ING.



Correspondence Solicited.

LUKENS STEEL COMPANY

COATESVILLE, PA.

BRANCH OFFICES

Philadelphia, Pa.; New York, N. Y.; Boston, Mass.; Baltimore, Md.; New Orleans, La. SELLING AGENCIES

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A. M. Castle & Co., of Washington Portland, Ore.; Seattle, Wash. SOLE EXPORT REPRESENTATIVE

Consolidated Steel Corporation, 165 Broadway, New York City

FIRST TO MAKE BOILER PLATES IN **AMERICA**

Over One Hundred Years' Experience.

LUKENS

The Leader for furnishing plates for Boilers and Fireboxes of All Types

All our plates leveled by special straightening rolls

STEEL PLATES:

Siemens-Martin O. H., Basic or Acid Steel.

Tank, Boiler, Ordinary Firebox, Locomotive Firebox, Marine and Special Specification Steel.

SHEARED PLATES:

24" wide up to 195" wide, inclusive, No. 8 thick and heavier.

UNIVERSAL PLATES:

8" wide up to 48" wide, inclusive, 1/4" thick and heavier.

FLANGING:

Machine-Flanged Boiler Heads, Flanged and Dished Boiler Heads, Flue Holes of any diameter.

LARGE MARINE BOILER HEADS FLANGED IN ONE PIECE.

LARGEST PLATE MILL (204" rolls) IN THE WORLD NOW IN OPERA-TION.

Have furnished boiler heads in one piece flanged to 15' 3" O. D., 11" flange, metal 11/8" thick. The flat size circle required was 199" diameter. These heads are used as front and back heads for marine boilers and formerly had to be 101 made in two pieces. To flange the heads in one piece eliminates seams and consequent riveting and as they are flanged by the spinning process they are heated all at one time, thus doing away with local strains and making a better job in a shorter time than in the case of two piece heads.

Rectangular plates up to 195" wide can be furnished.

Design your boilers, etc., so as to use wider plates and cut out troublesome seams. Send us your inquiries.

Confer with us regarding irregular flanging.

MANHOLE FITTINGS:

We can furnish fittings of all regular sizes.

HUSTON PATENT BOILER BRACE:

Superior in quality, strength, lightness in weight, workmanship, general appearance and finish.

Send us your inquiries, stating just what you want, and get immediate replies.



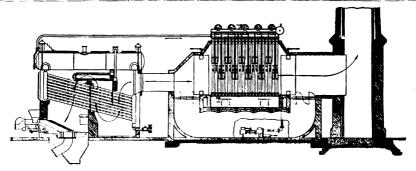
THE GREEN FUEL ECONOMIZER CO.

BEACON, N. Y.

GENERAL SALES OFFICE, 90 WEST ST., NEW YORK CITY, N. Y.

CHICAGO BOSTON PHILADBLPHIA PITTSBURGE CLEVELAND ATLANTA SAN FRANCISCO ST. LOUIS LOS ANGELES SEATTLE SALT LAKE CITY KANSAS CITY TUCSON HONOLULU Assoc'd with GREEN'S ECONOMIZER, Ltd.: TORONTO, MONTREAL, WINNIPEO, VANCOUVER E. GREEN & SON, Ltd.: WAKEFIELD, ENGLAND

Builders of Green's Economizers; Green's Steel Plate Fans; Green's High-efficiency, High-speed Radial Flow Fans; Mechanical Draft Installations



Typical Installation of Green's Economizer

GREEN'S FUEL ECONOMIZER:

The economizer consists of a number of cast-iron tubes and headers through which the feed water passes on its way to the boiler and around which the waste gases of combustion pass on their way to the stack. Its purpose is to heat the feed water under boiler pressure to a high temperature by means of the heat contained in the flue gases when they leave the boiler. It employs the "countercurrent" or "multi-stage" principle of heat transmission applied to steam generation.

The function of the boiler is to absorb from the gases of combustion, the heat required for vaporization and to provide for the separation of the steam from the water. The economizer, however, absorbs heat economizely from the flue gases, thus raising the temperature of the feed water to a point where the boiler functions only as a steam generator and not as a feed water heater. The result of this is either a decided fuel saving or an increase in the boiler capacity for the same amount of fuel. The economizer itself costs less, square foot for square foot, and is subject to a lower annual percentage for upkeep and depreciation than is the boiler.

As ordinarily sold the economizer reduces the flue gas to a final temperature

of 300° to 350° F. and pays from 40% to 100% interest on the investment, annually depending upon the operating and local plant conditions. The percentage of fuel saving may be approximated from the following formula:

Percentage Saving = $\frac{100(T-t)}{(H+32)-t}$ where T = Temperature of feed water after heating.

t = Temperature of feed water before

heating.

H = Total heat in steam above water at 32° F.

The following is a rough rule for determining the sizes. Allow about 5 square feet of economizer heating surface per rated boiler horsepower.

The 9' tube has 12.75 sq. ft. heating surface The 10' tube has 13.96 sq. ft. heating surface The 11' tube has 15.17 sq. ft. heating surface The 12' tube has 16.38 sq. ft. heating surface

The standard sections are 4-6-8-10 and 12 tubes wide with tubes 9'-10'-11' and 12' long and are built up in multiples of four sections,

Height over sections (9'-tubes) 10'214" Height over gearing (9' tubes) 13'514"

(Increase above 1 ft. for each 1 ft. increase in tube length over 9 ft.)

Length of one multiple of 4 sections 2'5".

Our Engineering staff will be glad to cooperate with you in any detail of your requirements. Write for our Bulletin No. 151.

THIS ECONOMIZER is especially adaptable in connection with waste heat installations.

THE GREEN FUEL ECONOMIZER CO.

GREEN'S FANS:

The Green Fuel Economizer Company specializes in the manufacture of fans of the most approved type, for all mechanical draft service.

RADIAL FLOW FANS:



Green's "RB" Radial Flow Fan

Green's Radial Flow, Hi-speed, Hiefficiency Fans are manufactured in two types: "RB" and "RR" for forced draft and induced draft service, respectively. These fans are exceptionally well suited to Modern Power Plant service, having been designed primarily for this duty. They are built of very heavy steel plate and wheels are mounted on heavy forged steel shafts and supported by extra large bearings, rigid ring oiled type, using the best grade babbitt. Each bearing mounted on independent pedestal with sole plates, on single inlet fans, the wheels are overhung and the shaft is supported by two bearings, mounted on a cast-iron baseplate, bearings are water cooled for induced draft service. The housings are large, well braced and stiffened for high pressure. A labyrinth seal has been devised to prevent the blow back of air through the inlet.

The capacity of standard fans runs from 1600 CFM to 275,000 CFM and from 1" to 7" inclusive, WG.

Due to the design of these fans, they are particularly adapted to high speed work and are therefore suitable for direct connection to turbine or motor running at the most efficient speed for these drives, thus, one gets a small compact, highly efficient fan unit. The fans themselves save 10% to 15% of the H.P. usually necessary for this class of work. In addition to this feature, the "RB" fans have a non-overloading power curve, which means absolute protection to driving motors.

We would be pleased to figure on your special requirements. Our bulletin No. 152 describes and illustrates the "RB" Radial Flow Fans, giving capacity tables and outline dimension drawings.

STEEL PLATE FANS:

These fans are used for all kinds of mechanical draft service, forced, induced, ventilation, etc., and are built with single or double inlet as the conditions may demand. They are made of heavy steel plate, the housing is reinforced and stiffened by angles, wheels are strengthened to withstand high pressures and medium speeds, the shafts are extra heavy and operate in rigid type ring oiled bearings, using the best grade babbitt. Where fans are used for handling hot gases, bearings are water cooled. On single inlet fans, where the wheel is overhung, two bearings are used with the center of gravity of the wheel as close as possible to the inner bearing. The standard steel plate fans are built with wheel diameters from 11/2'-16' and larger in special cases.

Our catalogue No. 127 will prove instructive. It contains tables and outline dimensions of all sizes of fans. We will be pleased to forward you a copy of this booklet.

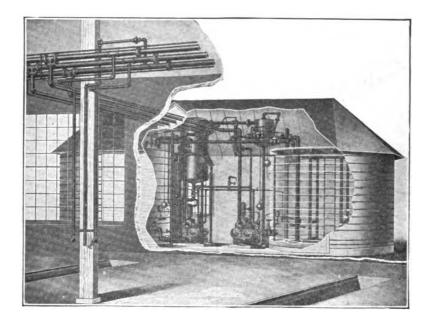
103

NATIONAL BOILER WASHING CO.

OF ILLINOIS

RAILWAY EXCHANGE, CHICAGO, ILL.

Contractors for General Pipe Work in Railway Terminals



104

NATIONAL HOT WATER WASHOUT & FILLING SYSTEMS FOR LOCO-MOTIVE BOILERS.

By the use of this system the blownout water from a locomotive is saved and used for washing this or other locomotives. The steam from the blown-out water is saved and used to heat fresh water to fill

this or other locomotives. Washing with hot water prevents tearing the boiler apart by rapid change of temperature. Filling with hot water means getting up steam more rapidly. Both mean a very decided saving in coal, water and time.

THE BAYER STEAM SOOT BLOWER CO.

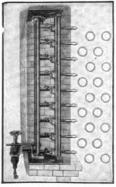
4056 PARK AVE., ST. LOUIS, U. S. A.

Manufacturer of Steam Soot Blowers

RECOMMEND THE BAYER:

Because-

In actual figures of cost and performance, Bayer Blowers have proved of greatest efficiency, economy and durability. With the Bayer installed, any type of boiler can be thoroughly cleaned of soot and ash accumulations every few hours. The cleaning operation is so simple that it is never neglected; the boilers are always clean. The saving in fuel alone is from 4 to 9%. The Bayer Blower is standard equipment on all Heine boilers and in general use upon practically all other makes. The Emergency Fleet Corporation purchased approximately 980 Bayer Blowers.



Vertical Baffle Type, showing furnace wall built up under lower nozzles to deflect hot gases.

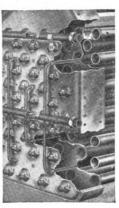
The Bayer Soot Blower does a thorough job. Just the turn of a valve and the work is quickly doneevery particle of soot and ash being removed. It is easy to use, devoid of danger to workmen. Affords greatest economy of steam, thereby saving fuel. Re-quires less time for blowing, thereby saving labor. Is safest, surest, most scientifically correct in every



Bayer Blower units as applied to thorough cleaning of the small boiler of the semi-vertical type. Simple, quick, dependable, efficient.

A Bayer for Every Type of Boiler:

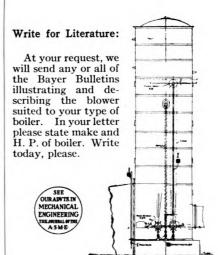
There is a type of Bayer Blower for every type of boiler. Leading Industrial plants everywhere have found them economical, easy to install, dependable and satisfactory. Upon installation they soon pay for themselves in the amount of fuel they save. Fuel Saving alone is from 4 to 9% in every case. Boiler room costs are also materially reduced by the saving in labor. time and expensive steam hose necessary in the hand hose method of cleaning.



Showing a Bayer Blower installed on horizontal water tube boiler, having hollow stayed water legs. Note the substantial simple construction.

105

For Wickes and other vertical types, there is a number of Bayer Steam Soot Blowers especially designed for the particular requirements of each installation. The number of blowing units, as well as their location, varies according to the conditions.



THE WILLIAMS GAUGE COMPANY

PITTSBURGH, PENNA.

NEW YORK

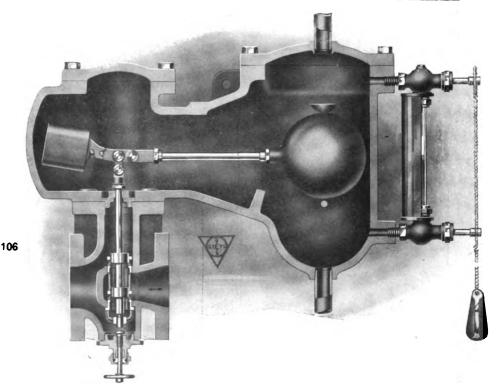
BOSTON

CHICAGO

St. Louis

CINCINNATI

Manufacturers of "Stets" Boiler Feed Controllers, H. & L. Alarm Water Columns, Williams Pump Governors



STETS BOILER FEED CONTROLLER —TYPE B:

If desired, can be used in place of the usual Water Column.

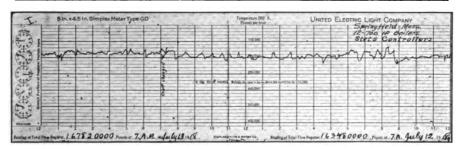
Description:

A spherical displacement body, filled with water, and counterbalanced to ride one-half submerged, possesses all the power of a closed or buoyancy float of same size, and for the high pressures used in latest steam practice has no chance for failure. The Stets Type "B" Controller design includes such a relation between weight of water-filled float and weight of counterweight and lever arms as will cause float to ride at its middle line at all times. Float will not lose its water content by evaporation because condensed steam which forms in upper steam connection to boiler drips into small

pan attached to top.

Controller is connected to boiler at water level. Whenever water in boiler rises, the float must rise with it, otherwise it will gain buoyancy in proportion to rise in water level around it, and will no longer balance counterweight. Leverage and weight of counterweight then become effective to PUSH valve steam Downward. When water level in boiler falls the float loses buoyancy and gains weight proportional to the fall, and its impulsive power then becomes effective to PULL valve steam Upward. As leverage is very great and no stuffing box friction on valve stem to prevent gradual movement, a powerful, positive and fine control of valve movement is secured. The valve opening bears a fixed relation to water level. This is accomplished by no other regulator.

THE WILLIAMS GAUGE COMPANY



Valve is of true balanced piston type. One sleeve serves both pistons and has eight V-Ports-four at upper and four near lower end. By removing jack-wheel entire sleeve may be withdrawn without disturbing valve or breaking pipe connections. Valve stem is guided at its extreme ends. These metal guides are in water and consequently lubricated—hence but little friction. There is sufficient inertia in the mass of the float and counterweight to prevent any quick oscillations of water level from adversely affecting valve control.

THE RESULT OF THIS DESIGN IS A RATE OF FEED PROPORTIONAL TO BOILER WATER LEVEL. THIS IS ACCOMPLISHED WITH FEW PARTS AND BY POWERFUL AND CERTAIN MEANS. AS ALL PARTS ARE IN PRESSURE SPACE THE USE OF A STUFFING BOX IS AVOIDED.

Finer control of flow may be obtained with V-Port Valve than with Disc Valve. The opening of a disc develops a rectangle. As a V-Notch Weir will measure wide range of flows of water more accurately than a rectangular weir, so will a V-Port Valve control flows far better than a Disc Valve.

The feed flow traced on a Boiler Feed Meter Chart is the evidence of efficient or inefficient boiler feeding. Wide sweeps of pen over chart and parallel to ordinates generally indicate action of a Regulator which does not control. As illustrated by chart reproduced herewith, correct mechanical feeding produces a flow line running to some degree diagonal to ordinates and abscissae—never parallel. Feed flow to a working boiler should be continuous and proportional to (1) steam demand, (2) steam flow, (3) furnace temperature. These three constantly changing factors are reflected in boiler water level, therefore feed valve movement should instantly parallel water level movement without lag or delay.

Send for Bulletin "B" and Installation Bulletins for further information.

WILLIAMS STEAM PUMP GOVERNOR:

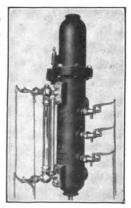
This Double Disc Type of Governor is of heavy construction to meet the requirements of severe and constant services. The entire absence of weights, cups or pistons permits of very close adjustment and gives exceptionally smooth The operation. governor is built in either angle or straightway style of body, with flanged or screwed ends.



"STETS" TYPE HIGH AND LOW SAFETY ALARM WATER COLUMN:

Especially designed for central station and other high pressure plants.

heavy Has pressure compensating float which prevents collapse under any operating steam pressure. Single float of displacelarge ment but one valve for both high and low alarms instead



of two light weight floats with doubled likelihood of trouble.

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107

NORTHERN EQUIPMENT COMPANY

MAIN OFFICE AND WORKS, ERIE, PA.

BRANCH WORKS: Manchester, England; Paris, France; Hamilton, Ont., Canada Representatives in All Principal Cities throughout the World

Manufacturers of Copes System of Feed Water Control



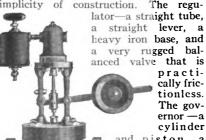
METHOD:

The regulator feeds continuously as long as there is a load on the boiler. On heavy loads it automatically drops the water level so as to increase the On light steaming capacity.

loads it automatically raises the water level, and saves furnace heat which would otherwise be wasted. On steady loads, it maintains a constant water level.

108 CONSTRUCTION:

A glance at the illustrations show the simplicity of construction. The regu-





delicate mechanism. Positive. No boiling valves, or other Direct. Simple. Practically no adjustments or repairs required after cutting into service. Practically no repairs. Many been operating daily for 20 years.

RESULTS:

Gives higher overload capacity. Removes unreliable human element from water control. Eliminates danger while new employees are being "broken in."

Saves fuel—4% to 8% or more.

Even distribution of load between boilers.

Smooth rate of feed: more legible steam and water meter charts.

Smaller feed lines and valves.

More even load on feed pump.

Dry steam, since the water level cannot exceed a predetermined level and because the level is a minimum

for greatest loads.

Higher superheat because water is not carried over into superheater tubes.

WHERE USED:

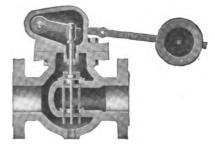
All over the world.

All over the world.

Wherever power boilers are used.
In 98% of the large modern central steam power stations of the U. S. A.
In over 90% of the modern boiler plants in the anthracite coal field. In practically every steel mill in the United States. In the majority of plants where modern devices to increase efficiency, save coal, and save labor are installed. On Heine, Striling, B & W. Erie City, Rust, Wickes, Manning, Badenhausen, Cahall, Bigelow-Hornsby, Nagle, Edge Moor, Keeler, Springfield, Geary, Ladd, Lancashire, Niclausse, Vogt, Union, and other makes of boilers. On boilers under all conditions of load and climate. On boilers aggregating a total of over 9,000,000 H. P. and varying in size from 50 to 2400 H. P. —mostly over 200 H. P.

THE BEST PROOF:

The fact that there are more Copes Regulators in successful daily operation than all other makes combined is proof of the superiority of the Copes System.



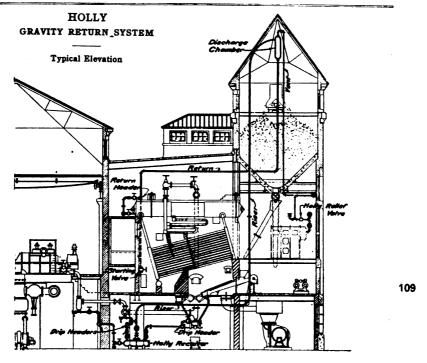
CATALOGS:

~ Ask for complete catalogs, quotation, charts, test data, etc. boiler conditions in detail. specifications, Give us your

RUSSELL B. HOBSON

NEW BRIGHTON NEW YORK

120 Broadway NEW YORK CITY



Service:

The Holly Gravity Return System receives and returns to the boilers condensation at 300 or 400° Fahrenheit and the corresponding pressures without waste of steam or labor of up-keep.

It forms a low, dry pocket, pulling the condensation out of every part of the steam piping or apparatus to be drained and throwing it back into the boiler so rapidly that it enters almost at the full boiler temperature.

Capacity:

The Holly System never tires. It is the watch dog of the power plant, and whether there is much or little to do, it stands ready to perform at its full capacity of many thousands of pounds per hour.

Effectiveness:

Its effectiveness is best attested to by

the satisfaction expressed by its users Through their courtesy we can show you many examples.

Efficiency:

The Holly System is most efficient because:

- 1. It discharges direct to the boiler at full temperature.
- 2. It is a closed system, and for this reason prevents the possibility of loss from leakage.

While we are equipping the newer types of power plants with Holly Systems, we have also a fruitful field in old plants, where by its use very material economies are to be effected, particularly with the existing high prices of fuel.

Consult us and let us quote you.

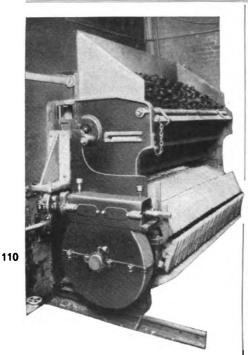
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THE JAS. A. BRADY FOUNDRY CO.

4524 Western Boulevard, CHICAGO

Branches in Principal Cities

Manufacturers of Special Service Stokers, Steam Jet Ash Conveyors, Coal Scales. General Jobbing Foundry Work. Heavy Gray Iron and Semi-Steel Castings



A Typical Installation of the Brady, Joseph Harrington Special Service Stoker

JOSEPH HARRINGTON SPECIAL SERVICE STOKERS:

The Joseph Harrington traveling grate has all of the advantages of both forced draft and natural draft operation.

Ideal Draft Regulation, Forced Draft or Natural Draft

Its special construction consists essentially of four draft chambers arranged transversely under the grate into which natural or forced draft, or any combination of both, are supplied by independently operated inlets. Through this effective means of draft regulation to any portion of the grate surface, fuels such as Texas lignite, coke breeze and many coals of clinkering tendencies (also semi-coking coals) are burned effectively and at high efficiencies.

This stoker uniquely combines the economy of natural draft operation and the non-clinkering advantages of the ordinary chain-grate, with the flexibility of other types of stokers.

BRADY COAL SCALES:

The "Reliance" coal scales are not only

accurate in measurement but are absolutely dependable. Heavily built, they stand up under the hardest kind of power plant usage, with little or no maintenance cost.



BRADY STEAM JET ASH CONVEY-ORS:

Brady Steam Jet Ash Conveyors save labor and cost in the handling of ashes in any boiler room. They are

made of Brady metal, a hard alloy that is not affected by the wearing action of steam and ashes. The amount of steam required per ton of ashes handled is low. Any arrangement can be made to



fit the layout of any boiler room so that ashes are deposited in any desired receptacle.

Write for complete Bulletins on Brady Power Plant Equipment.

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CARLING TURBINE BLOWER CO., INC.

WORCESTER, MASS.

Engineers and Manufacturers

BRANCH OFFICES:

NEW YORK BOSTON

CHICAGO PHILADELPHIA

CLEVELAND BIRMINGHAM

PITTSBURGH KANSAS CITY

MINNRAPOLIS ATLANTA

CINCINNATI DENVER



PRODUCT:

High grade Turbo Blowers for undergrate Boiler Draft and industrial furnaces. Made in seven (7) sizes 12" to 24" for normal boiler rating of 50 to 500 h, p. All Blowers good for 100% overload.

overload.

Blowers are shipped completely assembled and ready to operate as received by purchaser. They can be installed with very little work and are usually arranged to operate automatically with damper regulator or steam Regulator Valve. The cost of Blowers is very moderate and a complete return on investment usually made in a few months, after which they will prove a continuous dividend earner.

The design is very heavy and substantial. Bearings are the only parts requiring lubrication. They are so placed that they are not affected by the action of steam and will give long service. They can easily and cheaply be replaced.

Some Points of Advantage—Cheap Fuels are successfully burned. Clinkers practically prevented. High efficiency obtained. Poor Chimney draft overcome. Boiler capacity can be increased. Peak loads easy to meet. Steam pressure made steady.

VOLUME BLOWERS AND EX-CARLING HAUSTERS:

For Gas Producers, Oil Furnaces and other

industrial applications.

Air pressures from 1 to 16 oz. air volumes as

per requirements.
The constructi

The construction is heavy and substantial. No parts to adjust. The bearing on the driving

No parts to adjust. The bearing on the driving turbine only requiring lubrication.

The fan casing is made of cast iron and fan wheel of galvanized steel. These parts can be made of aluminum or bronze where acid fumes make it necessary.

The steam driving turbine as per Carling Specifications with all workmanship and material guaranteed. Blowers are made in several sizes.

Where your requirements demand special arrangement we will be pleased to give you figures on same.

CARLING POWER TURBINES:

Carling Power Turbines were especially developed to meet the demand for small power turbines ranging from 1 to 25 h. p. with speeds from 1,200 to 5,000 r. p. m. Turbine Rotors are of the impulse type and double stage, giving a high steam economy.

They can be supplied with or without governor They can be supplied with or without governor as desired and are especially adaptable for direct connection to centrifugal pumps, electric generators, blower fans, and other power drives of a similar nature.

They can be furnished with pulley for belt drive or Carling Reduction Gears as required. They are constructed of the very best workmanship and material and are guaranteed fully.

Advantages—High efficiency for power developed. Even drive rotation without centers to stop on. Especially adaptable for automatic control. Great economy in use of oil. Bearing only parts requiring lubrication. Exhaust steam contains no oil. Sensitive and close regulation by governor. Simplicity of construction; freedom from repairs. Requires no foundation; perfect balance. Can be placed in any location. Occupies little space. cupies little space.



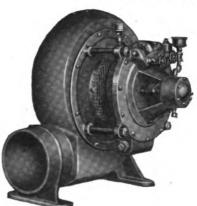


PLATE I CARLING TURBINE VOLUME BLOWER Right-Hand Drive Bottom Horizontal Discharge
(Standard Arrangement)



111

COPPUS ENGINEERING AND **EOUIPMENT COMPANY**

MAIN OFFICE AND WORKS

342-348 PARK AVE., WORCESTER, MASS.

Engineers and Manufacturers of Turbo Blowers, Steam Turbines and Turbo Pumps BRANCH OFFICES AND AGENCIES

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COPPUS CENTRIFUGAL TURBO BOILER FEED PUMP, TYPE CCC:

This pump with steam turbine forms a complete unit on a common shaft.

On turbine end, mechanical packing of the labyrinth type is employed, steamtight for ordinary back pressures, needs no adjustment, not subject to wear. On the pump end is the only stuffing box of the unit, with high-grade plastic metallic packing.

One oil reservoir serves both bearings. Oil level for ball bearings is maintained 112 regardless of amount of oil in the oil chamber.

Excess pressure pump governor and safety stop valve are furnished with every pump.

ADVANTAGES. - Simplicity of Construction and Low Upkeep.-Very few working parts, no valves. Only one stuffing box,



Coppus Centrifugal Turbo Boiler Feed Pump, Type CCC

easily repacked. Oiling system requires filling only a few times each year. No complicated governing devices and no sliding valves. Needs very little attention.

Continuous, Steady Flow of Water with-

out Pulsation.

Great Flexibility, Constant and Easy Control of Feed Capacity.—After excess pressure governor has been set to a certain pressure, once water capacity is regulated by hand feed valve at boiler. Constant water level is easily maintained.

Exhaust Steam Free from Oil. Longer Life and Less Depreciation—assured the buyer by the high grade of materials used, the careful design and workman-ship and the strict inspection and tests which must be passed.

Higher Steam Economy.—Steam economy should not drop more than 3% to 5% during the life of the pump.

Less Floor Space Required than for any reciprocating pump of corresponding capacity.

DATA REQUIRED WHEN MAKING IN-QUIRIES.—Name and location of plant. Total rated boiler capacity developed by boiler. Steam pressure. Degree superheat, if any. Temperature of feed water. Positive suction head (in feet) or pressure (in lbs.) under which water flows to pump. Back pressure against which steam is exhausted in pounds. Approximate length and size of feed line from pump to boiler. State if there is a big drop in steam pressure from boiler to pump. Advise if an open or closed heater is used or any other special arrangement.

COPPUS STEAM TURBINES:

This company builds steam turbines in sizes up to 50 h.p.

SIZES, CAPACITIES, ETC., OF TYPE CCC TURBO BOILER FEED PUMPS

Size	Capacity, B. H. P.	Max. Discharge Pressure, Lbs.	Steam Consump- tion, Lbs. per H. P. H.	* Pump Discharge Opening, Inches	Pump Suction Opening, Inches	* Turbine Exhaust, Inches	* Turbine Inlet, Inches
1 1/4 1 1/2 2 3	50- 250 250- 500 500-1000 1000-1600 1600-3500	135 165 175 200 200	75–80 65–70 60–65 55–60 52–55	1 (p. tap) 1¼ (p. tap) 1½ (p. tap) 2 3	1½ (p. tap) 2 3 3 4	2 3 3 4 6	1 (p. tap) 1½ (p. tap) 1½ (p. tap) 2 2½

^{*}All flanged pump and turbine connections are furnished with companion flanges.

COPPUS ENGINEERING AND **EOUIPMENT COMPANY**



COPPUS TURBO BLOWERS (TYPE C):

Built with either single- or doublestage impulse turbine, entirely enclosed, on the same shaft with a propeller fan.

Coppus construction insures quiet operation and high economy at the most efficient fan speeds. Turbine is provided with convenient hand valves for in-dividual nozzle control. The steam chamber is small, yet of ample cross-sec-

tion to prevent condensation.

The life of the machine depends largely upon the life of its bearings, and the life of the bearings is largely determined by their lubrication. It is very essential to give a great deal of attention to proper lubrication of the bearings on turbo undergrate blowers on account of the severe conditions under which they operate. The Coppus lubricating system is designed to take care of these exacting requirements. It is absolutely dust-proof, requires little attention, cannot get out of order with ordinary neglect and abuse, and no matter if some oil is used up, a constant oil level will be maintained in the upper chamber of the motor bushing.

The Coppus turbo blower is the only blower in which the fan does not overhang the bearing and in which the exhaust steam is discharged into the fan casing when desired, where it mixes thoroughly with the air. All stuffing boxes have been eliminated.

It delivers more air, size for size, at any specified pressures and uses 25%to 75% less steam than any other turbo blower made. This claim can be proved

by comparative tests.

Special attention has been given to the fan casing in order to insure the highest efficiency. The casing hugs the fan and is expanded immediately beyond, relieving the chocking effect on the air by the casing, greatly eliminating friction and preventing the formation of eddy currents. This feature (Patent No. 1,308, 982) has gone through all the tribunals of the United States Patent Office, during 4 years of interference proceedings, and this company has been awarded priority of invention of the expanded casing to the exclusion of all others.

HOW TO CHOOSE THE SIZE BLOWER BEST ADAPTED TO ANY BOILER:

For low steam consumption, high air delivery, simplicity of operation, low cost of upkeep and reliability, the Coppus turbo blower has proved a generally

accepted leader.

This company's advice is, do not try let the Coppus engineers do it. This will save considerable time and will avoid trouble and disappointment. It is not only a question of blower capacity, but the conditions under which the blower must operate that enter largely into its selection. One cannot afford not to take advantage of this company's wide experience, as this experience, more than mere calculations, will solve all blower problems.

Write for data sheet and send the necessary data so that conditions can be studied from every angle and a report will be furnished with this company's recommendations.

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Coppus Turbo Blower, Type C

SIZES OF COPPUS TURBO BLOWER, TYPE C

Size, Fan	Size, Turbine	Steam Inlet	Number of Nozzles
10	9	1/2	- 1
12	12	3/4	2
14	12	34	2
16	16	1	3
18	16	1	3
20	20	1	3
22	20	11/4	3
24	20	134	3

B. F. STURTEVANT COMPANY

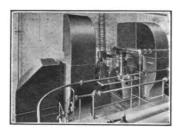
HYDE PARK, BOSTON, MASS.

Offices in All Principal Cities

Mechanical Draft, Fuel Economizers, Steam Turbines, Steam Engines, Gasoline Engines, Gasoline Engine Generating Sets, Motors, Generators, Steam Traps, Heating and Ventilating Systems, Fans, Blowers, Exhausters, Etc.

MECHANICAL DRAFT:

Draft produced by a fan is called mechanical draft, and may be forced or induced as conditions demand. Its cost is from 20 to 40 per cent of that of a chimney. Its intensity permits of the burning of finely divided or low grade



114 fuel. It makes possible the utilization of the flue gases which a chimney wastes in producing draft, it is independent of the weather, decreases smoke, increases the capacity of an existing plant, and serves as an auxiliary to a chimney already overburdened. It saves space and is portable.

FUEL ECONOMIZERS:

The Sturtevant Economizer effects:

A saving of 5 to 15 per cent in fuel.

An increase of 10 to 25 per cent in boiler capacity.

An appreciable extension of the life of a boiler. A purification of the feed water.

A reduction in expense of repairs.

Removes the deposit of large amounts of soot.



In the Sturtevant Economizer the pipes are arranged "staggered" Economizer instead of in straight instead of in straight rows, thereby giving the pipes a better oppor-tunity to absorb heat from the gases. These economizers are made with taper metal-totaper metal-tometal joints that require no packing, cement or rusting. The placing of the pipes of one row opposite the spaces of the adjacent sections increases the effective area of the transmitting sur-iaces and thoroughly breaks up the currents of

hot gases by directing them between the pipes and against those standing in their paths.

STEAM TURBINES:

The Sturtevant Steam Turbine is of the multivelocity type, and its operation is such as to give high efficiency, and permit of moderate rotative speeds without gears. Hand valves are used for shutting off the nozzles, and the



speed is regulated by a centrifugal throttling governor placed on the end of the shaft.

Internal lubrication is unnecessary, therefore the exhaust steam is free from oil. 5 regular sizes from 5 to 250 H. P.

Approximate speed from 4000 to 1000 R. P. M.

STEAM ENGINES:

(Automatic High Speed)



Vertical Single Cylinder from 1 to 150 H. P. Sturtevant

Engines adapted to continuous operation for long periods without attention. Gravity or forced feed lubrica-tion and complete enclosure of moving parts insure cleanliness and high mechani-cal efficiency.

cal gives 11/2 per cent speed regulation on automatic engines.

MOTORS, GENERATORS AND GENERATING SETS:

Direct Current Apparatus for any Standard Voltage

Bi-Pole Motors (enclosed and			
semi-enclosed type) Four-Pole Motors	1/4 to	3 Н.	P
Four-Pole Motors			
Eight-Pole Motors		225 H.	
Six-Pole Generators		17½ H.	
Eight-Pole Generators	20 to	150 K.	W.
Turbine Generating Sets	3 to	50 K.	W.
Steam-Engine Generating Sets.	. 5 to	150 K.	W

B. F. STURTEVANT COMPANY

PROPELLER FANS:



Propeller fans are designed for use against low pressures, and are applicable for ventilation and exhauster work in boiler and engine rooms, kitchens, clubrooms, smoking rooms, offices, stores and similar places.

They are constructed with a frame

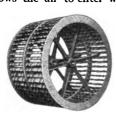
of cast iron that is fastened into the wall of the building and are driven by either belt or direct-connected electric motors. The construction of these propeller fans is exceptionally strong and durable. Propeller fans are made in sizes from 18 to 120 inches in diameter.

MULTIVANE FANS:

The blast wheel or runner for the fan is composed of shallow floats, which permit the use of very large inlets while maintaining the necessary blade area. The large inlet al-



lows the air to enter with the least loss



in friction. Each blade or float is spooned to distribute equally the pressure within the casing and to add rigidity and strength to the wheel.

STEEL PLATE FANS:

Sturtevant Steel Plate fans are designed for blower and exhauster work. They are the result of fifty years' experience in blower design, are especially strong and durable and are suitable for direct-connected steam engine and electric motor drive and for belt drive. Steel plate fans are built for ventilation and mechanical draft installations, and for planing mill and other exhaust work.

BLOWERS AND EXHAUSTERS:

Positive pressure blowers are designed to deliver air at pressures up to five pounds. They are especially adapted to furnishing blast for cupolas, gas and oil burners, annealing and smelting furnaces,



cement kilns, and for all sorts of blower and exhauster work demanding high pressures. Special stuffing boxes to prevent leakage are furnished when these blowers are used to handle gases.

One feature in the operation of this blower which is of special importance in gas exhauster work is the lack of pulsations in pressure. This will at once be appreciated where it is desired to use the exhauster on distributing lines without the intervention of a gas holder.

STURTEVANT HEATERS:

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The Sturtevant fan system of heating and ventilating is economical and positive, heated air providing ventilation as well as heat. Indirect hot blast coils are built of one inch extra heavy steel pipe screwed into cast iron sectional heater bases. Entire heater is enclosed in steel plate casing. Heater is applicable to use of either live or exhaust steam or hot water. System can be used for heating and ventilating any kind of building.

The operation is independent of the weather or of atmospheric conditions. By the use of the Sturtevant air washer, the



air may be washed at all times, and cooled in summer. Hot air from the heater is forced by a fan through ducts into the building to be heated, and is allowed to escape through vent flues. Fans are driven by steam engine, motor or belt. The steam engine exhaust is used in the heater, thus obtaining heat at practically no expense. Temperature of air entering each room may be closely regulated by thermostatic control.

THE ENGINEER COMPANY

17 BATTERY PLACE, NEW YORK CITY

BRANCH OFFICES

ATLANTA BOSTON CHICAGO CLEVELAND DETROIT MINNEAPOLIS Montreal New Orleans Philadelphia

PITTSBURGH ST. LOUIS WILKES-BARRE

Balanced Draft

A Better Combustion System

The Balanced Draft System secures a constant, pre-determined draft at all times, for all rates of combustion, regulating automatically the supply of air required for combustion and the flow of waste gases from the furnaces.

Where stokers are used, it also secures automatically a rate of fuel feed equal to the rate of fuel consumption in each 116 furnace.

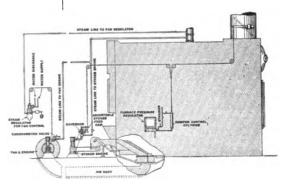
The diagram below shows the Balanced Draft System as applied to an underfeed furnace. The steam pressure regulator controls the speed of the blower. The furnace pressure regulator controls the flue damper, and, by means of the adjustable cam, the speed of the stoker engine. In each case, the operation of the control is automatic.

When the furnace pressure regulator is set for the draft of highest efficiency, it constantly maintains it, thus increasing the percentage of CO₂, and lowering stack temperatures. The efficiency of the heating surface and the capacity of the stack, both are increased.

Regardless of the fuel used—coal, oil or gas—Balanced Draft control of air supply and damper opening ensures the correct amount of air for best combustion, reduces the velocity of the hot gases through the boiler and prevents heat dilution by leakage of outside air.

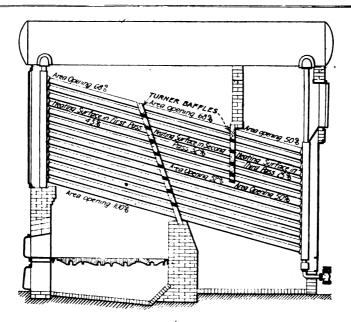
The Balanced Draft system of controlling fuel feed in direct relation to damper opening ensures automatic changes in the individual fuel beds to meet varying rates of combustion. It also permits manual adjustment in anticipation of peak loads and other special conditions.

The net result is more power at less cost. Complete information on request.



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THE ENGINEER COMPANY



Turner BaffleWalls

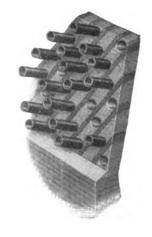
The Turner Baffle Wall is composed of fire brick and fire-resisting cement in a plastic condition. It is built by our own expert workmen with our own materials and can be easily built from the inside without the removal of the side walls. Can be used in any type of boiler or superheater where the tubes pass through the baffle; a carefully worked out engineering structure.

Built at the right slope, without limitations as to angles, the bridge wall may be carried back to any position. This increases the radiation surfaces of the lower rows of tubes and largely prevents clogging, due to flying slag particles, and also reduces the effect of reflected heat on stokers and furnace lining.

Turner Baffles are built tight. They stay tight—under most severe firing conditions. Cannot loosen, spawl, flake off or crumble. Tubes can be withdrawn without injury to the walls.

In use in boilers totalling over 200,000 horse power.

Complete information on request.



"Tight as a Drum"



THE AUTOMATIC FURNACE COMPANY

DAYTON, OHIO

Manufacturers of Coal Burning Equipment

80 BROAD ST., NEWARK, N. J.

205 S. ST. PAUL. MINN.

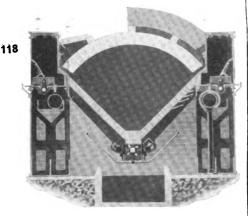
BRANCH OFFICES:
ROBERT ST., 231 INSURANCE EXCHANGE BLDG.
CHICAGO, ILL.

MODEL AUTOMATIC SMOKELESS FURNACE:

The Model Automatic smokeless furnace is so designated because it is an improved form of the side-feed type and embodies greater utility than any other make or type.

The devices for getting rid of the ash have been so designed and perfected that the furnace keeps the fire clean all the time, even when low grade fuel is

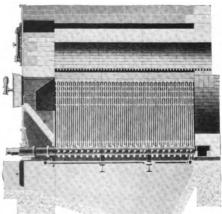
The principle parts of the furnace are not exposed to damage and will last a life-time. The grates are in pairs, one piece of each being stationary and the other movable.



Illustrations show the narrow surface of each grate that is exposed to the heat and the broad surface on which the air acts and cools as it is drawn into the fire bed.

Each pair of grates can be renewed separately and each section of the bar that grinds up and discharges the clinker and coarse refuse can be renewed separately, and, if necessary, without putting the furnace out of commission or seriously interfering with its operation.

Air enters the fire chamber and is so admitted as to avoid overheating of the fire arch, arch plates and other parts and insures instantaneous, complete combustion.



DRAFT: The Model Automatic operates with either natural or induced draft.

There are Model Automatics where ample draft is available that have crowded 500 H. P. boilers to 1500 H. P. for days at a time, maintaining a clean stack.

AUTOMATIC REGULATION: combination draft and fuel feed regulator can be applied so that the rate of fuel feed, air supply and combustion correspond to the steam requirements.

No other mechanically operated furnace lends itself more advantageously to economic use of mechanical coal or ash handling. The clinker and other coarse refuse is broken up, so the ash is in suitable condition for any desired method or system of ash handling.

REPAIRS: The construction and arrangement of the Model Automatic Furnace provides for maximum self-protection to all parts subject to damage by heat or wear, and there is, therefore, a minimum cost for maintenance. The fuel saving is sufficient to pay for the necessary repairs and also give a large return on the cost of installation.

installation.

OPERATION: A small steam engine or electric motor is furnished with each furnace, battery, or row of furnaces driven through a set of double worm gears, thus giving ample power with use of little steam.

Mechanisms for operating both the stoking and cleaning arrangements are on the outside of the front, not exposed to the heat of the fire. Each part can be disconnected or connected without stopping engine or motor. Motion of clinker grinder can be varied to suit amount of refuse in the coal by simply pulling out a single pin and replacing it in the desired position, to keep the fire clear of refuse and not waste combustible in the ash.

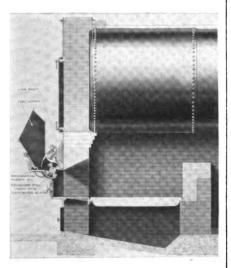
THE AUTOMATIC FURNACE COMPANY

CHAIN GRATE:

This company also manufactures the Model Chicago Chain Grate. It is of rugged, heavy construction and is designed to stand the trying service of boiler room equipment. Detailed description will be gladly sent on request.

THE DAYTON COAL FEEDER:

Is designed to meet the requirements of small boilers. It gives a constant light feed of coal and an even distribution over the grate surface, which results in increased efficiency and capacity and the elimination of the Smoke Nuisance.



It is practically foolproof, so reduces the amount of labor required and assists in eliminating the human element. As it is not exposed to the heat of the fire maintenance is nil.

THE CULVER SHAKING AND DUMP-ING GRATE:

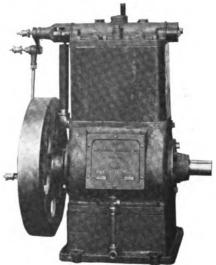
Has both a shaking motion, which is sufficient to clean the grate surface of ash and clinker, and a dumping motion in which every other grate raises up and the others drop down. When in this position the grates can be rocked, which will break up the largest and hardest of clinker and as an 8" opening is afforded everything on 8" opening is dumped into the ash pit.



The fire surface is made up of small clips which slip into place and lock in position. As the grate is of substantial design maintenance is reduced to a minimum.

MODEL ACME STEAM ENGINE:

USES: There are now thousands of Acme engines in operation, and owing to their rugged construction, simple and durable design, they have no equal, operating as they do with the minimum amount of attention.



DESCRIPTION: Engine is of the single acting, two cylinder type. Designed to operate under a steam pressure of from 80 to 200 lbs. and a speed of 150 to 600 R. P. M. A pair of vertical cylinders are placed above an enclosed crank case which serves as a rigid foundation for the engine as well as a reservoir for the oil used in the automatic splash system of lubrication.

It is provided with generous sized ports for quick inlet and exhaust of steam. Valve is a one piece casting ground to fit an accurately bored chamber, the latter piece also serving as a cylinder head. Automatic relief valves are provided in the top of the cylinder head to insure quick release of any water which may collect in the cylinders, thereby eliminating any chance of damage from this source.

All bearings of this engine are of ample size and are continuously lubricated by a positive splash system contained in the crank case.

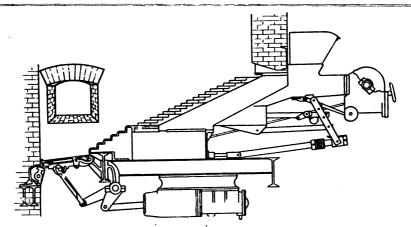
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AMERICAN ENGINEERING COMPANY

PHILADELPHIA, PENN.

BRANCH OFFICES: BOSTON, NEW YORK, BALTIMORE, PITTSBURGH, CLEVELAND, CINCINNATI, DETROIT, CHICAGO, NEW ORLEANS, DENVER, and SALT LAKE CITY. Taylor Stoker Co., Ltd., Toronto, Ont., Canada.



Application: Successfully applied to any boiler, either water tube or fire tube, to dryers, heat-treatment furnaces, and **120** metallurgical furnaces.

Construction: The TAYLOR STOKER is made of standard retorts which have a depth correctly designed to permit packing of coal. This makes it possible to introduce draft under high pressure without blowing holes in the fuel bed. The increased density of the fuel bed promotes scrubbing action of air and gases of combustion, thereby procuring a more intimate mixture and a higher degree of combustion than would otherwise be possible. Coal and air supply are controlled by automatic regulation which is adjustable to various proportions in accordance with the quality of coal used. Refuse is removed by either hand or steam dump or by rotary crusher dump. The latter is continuous in operation.

All working parts are outside the furnace. A shearing pin in the speed-shaft clutch provides against damage due to foreign matter in the coal.

Flexibility: The TAYLOR STOKER responds instantly to steam demand. Authentic records, reproduced in pamphlet form, are available on request. The



are available on request. The curves show a variety of conditions: dead bank to 270% of rating; no steam to 350% of rating, etc., with fuel range from lignite to high grade bituminous coal.

Capacity: The TAYLOR STOKER is capable of very high capacity because of the correctness of its design; i. e., the arrangement of rams and the possible adjustment of their stroke, the design of tuyeres, and the depth of the fuel bed. The fire bed is not agitated by mechanical means, and the fuel burns completely with a short, intense flame. Normal operation at 175 to 250% of rating is common practice with users of TAYLOR STOKERS. Peak loads requiring up to 350% of capacity can easily be carried for periods of one to four hours. Higher ratings have frequently been obtained, even over extended periods.

Service: Experts on steam production are available for engineering consultation. Inquiries are cordially invited.

Users of TAYLOR STOKERS include:

New York Edison Co.
Interboro Rapid Transit Co.
Detroit Edison Co.
Philadelphia Electric Co.
Standard Oil Co.
American Smelting & Refining Co.
Warner Sugar Co.

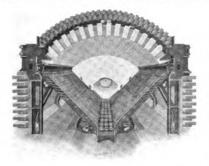
Procter and Gamble Co.
Studebaker Corpn.
Ford Motor Co.
Solvay Process Co.
Fisk Tire Co.
Cambria Steel Co.
Pennsylvania R. R. Co.
And many others in all
branches of industry.



DETROIT STOKER COMPANY

DETROIT, MICH.

THE DETROIT "V" TYPE STOKER:



Rear View—Detroit "V" Type Stoker with Radial Sprung Arch

The Detroit "V" Type Stoker has been on the market for twenty years and its many refinements in design and construction make it the most efficient Stoker of this type on the market.

It is adaptable to all types and sizes of Boilers. It burns economically all grades of bituminous coal and is capable of handling variable loads and heavy overloads with a minimum of attention. Saving in fuel costs vary from 10% to 25% and labor saving from 50% to 75%.

It is automatic in all its functions. It continuously feeds and distributes the coal and removes the ash and refuse.

Coal is continuously fed from the Coal Magazines to the upper end of the Grates. Each alternate Grate has a slicing motion which prevents clinker from forming on the Grates and keeps the entire fuel bed moving towards the Clinker Crusher at the bottom.

The Clinker Crushers have a continuous motion, grind-

ing the clinkers and depositing the refuse in the Ashpit below.

The Detroit Stoker can be equipped with either the Radial Sprung Arch or the Detrick Flat Suspended Arch. Each tile of the Flat Arch is independently suspended from the center, allowing free expansion and contraction, and can be easily replaced without disturbing the Arch or brickwork.

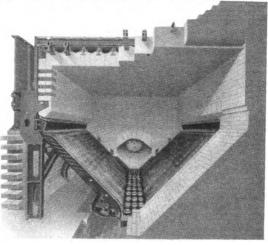
This Arch insures high furnace and boiler efficiency and capacity as the gases of combustion are distributed evenly across the entire width of the Boiler.

The Arches are cooled by air admitted through openings in the front of the Stoker and being preheated passes into the furnace under control, through the tuyere over the coking coal supplying the oxygen for combustion.

nd

Adjustments of the Stoker are easily and quickly made while in operation to meet any conditions of load or any grade of fuel.

Send for Catalogue D. Address Detroit Stoker Company, Detroit, Mich.



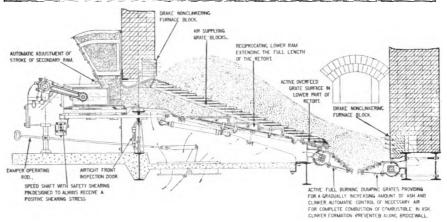
Rear View—Detroit "V" Type Stoker with Detrick
Flat Suspended Arch

THE FREDERICK ENGINEERING CO.

FREDERICK, MARYLAND

GENERAL SALES OFFICE 61 Broadway, New York City WORKS AND ENGINEERING OFFICES Frederick, Maryland

Manufacturers of the Frederick "Central Station" Type Underfeed Stokers, the Frederick "Industrial" Type Underfeed Stokers, the Frederick Steam Jet Ash and Dust Conveyors



FREDERICK "CENTRAL STATION" TYPE UNDERFEED STOKER

122 Construction:

The Frederick "Central Station" type stoker is built on the inclined unit retort principle. The coal feed and air supply are automatically controlled to meet load demands. The ash and clinker is automatically deposited on the active dumping grates, which automatically provide space for the increasing amount of ash and clinkers, and automatically maintain the proper amount of air for complete combustion of the fuel at this point.

Adaptability:

Due to its simple construction with no operating parts below the floor line, the stoker is applicable to any type of boiler and can be set to give a relatively large combustion space, under relatively low boiler settings.

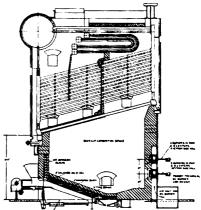
Flexibility:

The moving retort bottom acts on the entire fuel bed, distributing the fresh fuel over the air distributing tuyeres and quickly breaks up a banked fire. 250% of boiler rating can be obtained in less than five minutes from a banked boiler.

Capacity:

Due to the large underfeed grate area per retort, the special design of the tuyeres used and the constant breaking up action of the moving retort bottom, the capacity which can be obtained with the Frederick Stoker installed within ordinary furnace dimensions varies between 300--350% of boiler rating. Service:

We maintain a service department always ready to assist our customers in connection with our stoker installations.



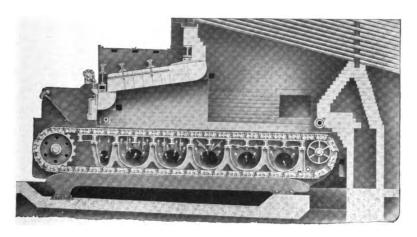
Boiler Equipped with Frederick Underfeed Stoker and Oil Burners

Our stokers equipped with clinker grinders maintain constant uninterrupted furnace condition; combustible in ash 8-12%—minimum of manual attention—one fireman can attend 10,000-15,000 h. p. boiler capacity.

THE ILLINOIS STOKER CO.

ALTON, ILLINOIS

Manufacturers of Chain Grate Stokers Type "G" Forced Draft Type "A" Natural Draft



The use of Mechanical Ignition and Air Control, when burning anthracite coals and culm, coke breeze, high moisture lignites, and bituminous coals and screenings on the type "G" forced Draft Stoker, insures high ratings and efficiencies at all times and under all conditions.

When anthracite coals and culm, coke breeze and high moisture lignites are burned on this stoker, POSITIVE UNINTERRUPTED IGNITION is secured by placing the first zone or tuyere under induced draft conditions, whereby a small portion of the hot furnace gas is drawn down through the incoming green

When such a system of ignition is not provided, it is impossible to obtain perfect and complete ignition at all times with the above fuels. The arch must be depended upon to thoroughly ignite the fuel, and the direction of air supply is opposite to the direction of ignition penetration. This causes complete ignition to be slow, and often retards ignition and combustion of the leaves become nition and combustion of the lower layers of fuel to such an extent that unburned combustible is discharged to the ash pit, resulting in high carbon content ash and consequent avoidable fuel loss. Where high ratings and sudden peak loads are encountered, ignition will be very poor or fail entirely

With the Illinois system, continuous, perfect, mechanical ignition is assured at all times, regardless of the boiler load, inasmuch as the volume and static suction at this induction zone are easily and 123 instantly adjustable to meet any speed of grate travel and thickness of fuel bed.

The remainder of the tuyeres are used under forced draft conditions, each tuyere being equipped with two individually controlled dampers. the shafts of which are on 12-inch centers. This means that each foot length of grate surface can be controlled independent of any other sec-tion of the grate. The wide range of control for each damper, and consequently for each foot length of grate, permits regulation of intensity of draft and quantity of air to suit any condition at any portion of the grate.

Thus simply and effectively does this stoker overcome the inefficiency of a fixed grate area with no air control. It provides perfect air control, and allows adjustment to meet efficiently and economically any load condition that may arise by varying the active grate surface -by means of the air control dampersto suit the boiler load, thereby giving a flexible machine capable of developing a wide range of capacities at maintained maximum efficiencies. The intensity of heat can be maintained and the quantity varied to meet all conditions, for the proper grate area is at the command of the operator by merely turning one or more

Write for a copy of our new Catalog "L."

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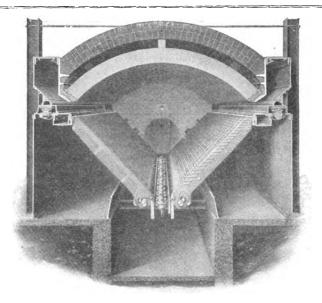
124

MURPHY IRON WORKS

FOUNDED 1878

DETROIT, MICHIGAN

Manufacturers of the Murphy Automatic Furnace



The Murphy Automatic Furnace
REAR VIEW

THE MURPHY AUTOMATIC SMOKELESS FURNACE is automatic in all its functions. It continuously feeds and distributes the coal and removes the ash and refuse.

It is adaptable to any type of boiler from 50 H. P. up to the larger units for which the multiple retort underfeed stoker is best suited.

It will handle economically all grades of bituminous fuels and will burn other fuels efficiently enough when bituminous coal is not available.

It is capable of handling variable loads and heavy overloads efficiently and with minimum attention.

The cost of maintenance is low, averaging about 10c. per horsepower per year.

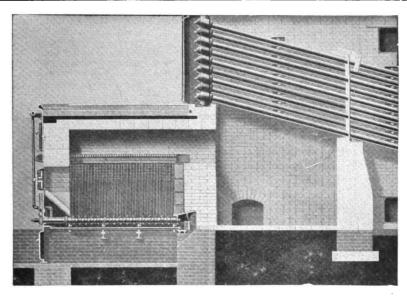
In cost of operation the Murphy Furnace demonstrates especially the advantages of over 40 years of stoker experience.

Refinements in design and construction have reduced the cost of operation to the lowest limit.

The cost of operation is less than 1%, due principally to the use of natural draft, balanced mechanism and ease of actuation.

The arrangement of the grates, commonly known as "opposed type," offers many advantages. It gives double the coking area—necessary for smokeless combustion. It eliminates loss of heat due to radiation through side walls. It permits passing the air through the arch when it is preheated, effecting a further saving in heat units.

MURPHY IRON WORKS



Murphy Automatic Furnace-Dutch Oven Setting

At each side of the stoker extending from front to rear are the coal magazines into which the coal may be introduced either by hand or mechanically. At the bottom of these magazines are the coking plates against which the inclined grates rest at their upper ends. The stoker boxes, operated by segment gear shafts and racks, push the coal over the coking plates and on to the grates. The grates are made in pairs, one fixed and the other movable. The stationary grates at their lower ends rest on the grate bearer, which also acts as a support for the clinker grinder. The clinker grinder consists of a steel shaft, on to which is slipped cast iron toothed segments, which are readily replaced in case of breakage.

Just over the coking plates are the arch plates, from which a fire brick arch is sprung over the entire stoker. Upon these arch plates are cast numerous ribs to

form a series of air ducts immediately over the coking plates, conveying the heated air from the chamber above the arch into the combustion chamber. These arch plates also form the walls of the magazines. The stoker, or battery of stokers, can be operated by a small automatic engine, motor or by overhead shaft and ratchet drive, as may be desired. Arrangement is made for exhaust steam connections at the lower end of the grates for the protection of this portion of the grates and clinker grinders and for the softening of the clinker.

In connection with horizontal tubular boilers or water tube boilers horizontally baffled, the Murphy stoker can be installed with a flush front setting. Arrangement can be made for extended or Dutch oven settings, should this be desired.

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SANFORD RILEY STOKER CO.

WORCESTER, MASS.

BRANCH OFFICES

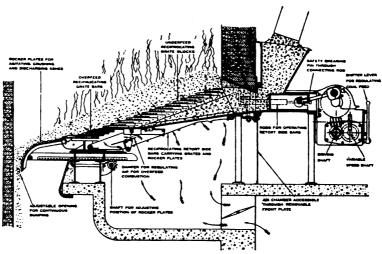
BOSTON NEW YORK CLEVELAND CINCINNATI

PHILADELPHIA DRTROIT

PITTSBURGH CHICAGO

ST. PAUL

BUFFALO DENVER



THE RILEY SELF-DUMPING UNDERFEED STOKER

Adaptability: Applicable to any boiler either water tube or fire tube, and to heating and smelting furnaces.

Construction: Stoker is of the inclined underfeed type; that is, the coal is forced up from beneath the point where air is admitted, and then is worked along toward bridge wall. The coal feed and air supply are automatically controlled to meet load demands.

Instead of stationary dead plates, it has moving, air supplying grates carried by reciprocating sides of retorts. These retort sides also move the overfeed grates which extend across the entire width of the stoker below the retorts. Beyond these are the rocker dump plates which continuously agitate, crush and discharge the ash.

Motion of these reciprocating parts is adjustable, so as to control movement of fuel bed and dumping of refuse. This reciprocation of alternate retort sides, in opposite directions, is the distinctive feature of the Riley stoker.

Efficiency: Extraordinarily high efficiency at all ratings is obtained due to the complete and intimate mixture of the fuel with just the right amount of air.

Smokelessness: The stoker and its forced draft fan are so connected as to give the correct amount of air for fuel burned. Complete combustion, without smoke, results at all times. The Riley

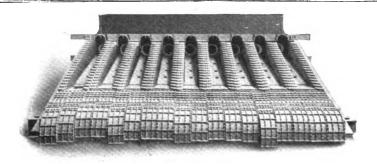
stoker is guaranteed to meet smoke laws of any city in the United States.

Capacity: Due to the constant movement of the fuel bed caused by the reciprocating retort sides the clinkers which ordinarily retard combustion are broken up; therefore, with RILEY STOKERS the gases are not choked and active combustion results at all times. The boiler capacity which can be obtained with the RILEY STOKER depends upon the number of retorts that can be installed. With boilers fired from one end 300 and 350% of rating are obtained during peaks. In other cases where boilers are fired by two stokers set back to back 500 and 600% of rating are possible.

Flexibility: Moving grates in the Riley stoker give an ideal means of slicing and starting up quickly from a banked fire, the fuel bed being instantly broken up and active combustion begun as soon as air is admitted. This feature makes the Riley stoker especially adapted for socalled "stand-by" plants. In case of

SANFORD RILEY STOKER CO.

WORCESTER, MASS.



Furnace View of 9-Retort Stoker

factory loads, it enables stoker to drop load within two or three minutes and pick it up instantly when operation is resumed. RILEY STOKERS will raise a boiler from banked fire to 250% of rating in five minutes.

Safety: Each plunger connecting rod is provided with a shearing pin, which absolutely prevents damage to stoker in case plunger is blocked. This device is equally effective at all points in plunger stroke. Excessive pressure shears the pin, which allows rod to move freely without moving plunger. After obstruction has been removed, pin is easily replaced while crank passes its outer center.

Fuel Control: The Riley Two-Speed Gear Box provides for an adjustable fuel supply. On large units the fires can be levelled, thinned or thickened as required.

When a number of stokers or gear boxes are driven by a single prime mover, any stoker or the retorts on any gear box can be operated practically *independently* of all other stokers or gear boxes. This effects a saving in fuel since there is no necessity for carrying over coke when trying to divide the load equally among a

number of stokers, or when building up thin sections of the fuel bed in a wide furnace.

A FEW INSTALLATIONS OF RILEY 127 STOKERS:

Massachusetts Institute of Technology Hartford Electric Light Co. Remington Arms & Ammunition Co. New York Central Railroad Co. Buffalo General Electric Co. Public Service Electric Co. Youngstown Sheet & Tube Co. Milwaukee Electric Railway & L'g't Co. Columbus Railway, Power & Light Co. E. I. du Pont de Nemours & Co. Goodyear Tire & Rubber Co. American Steel & Wire Co. Graton & Knight Mfg. Co. New Haven Pulp & Board Co. Erie Forge & Steel Co. Hercules Powder Co. Midvale Steel Co. Turners Falls Power & Electric Co. Pierce Arrow Motor Car Co. American Sheet & Tin Plate Co. Brier Hill Steel Co. Steel & Tube Co. of America Indianapolis Light, Heat & Power Co. The Viscose Company.

THE UNDER-FEED STOKER CO. OF AMERICA

GENERAL OFFICES: BOOK BUILDING, DETROIT

Makers of the Jones Stoker

BOSTON BUFFALO CHARLOTTE CHICAGO

CINCINNATI CLEVELAND DENVER KANSAS CITY

MINNEAPOLIS New Orleans New York PHILADELPHIA PITTSBURGH

SAINT LOUIS SALT LAKE CITY SEATTLE TORONTO

JONES "STANDARD" STOKER:

The operation of the Jones "Standard" Stoker is shown in the illustration below. Coal is fed to the hopper, outside the furnace wall, and is moved forward and upward by the successive action of the ram and pusher blocks. The fire is always on top and as the fresh coal is slowly pushed upward it is gradually heated until coked. The extreme simplicity of this stoker may be understood from the illustration below. Few be understood from the illustration below. Few moving parts, none in contact with the fire, explains the extremely low repair costs. The retort or fuel magazine is installed inside the furnace. It consists of a heavy casting, along the top edge of which are arranged tuyere blocks, through which air is supplied. An auxiliary ram or pusher rod in the bottom of the retort moves in conjunction with the main ram and insures an equal distribution of the fuel in the furnace. Because this ram is at the bottom of the retort



Jones "Standard" Stoker

it is entirely covered by fresh coal when the stoker is in use. The stroke of the pusher rod may be adjusted to suit any fuel.

The ash accumulates on the dead plates along either side and is removed through the cleaning doors in the front. The supply of air and the supply of fuel are automatically proportioned so that high efficiency of combustion is the result. As this automatic control is regulated by the steam pressure and is immediately responsive to even the slightest variations, the steam pressure is held very even at all times.

This stoker is adaptable to any size and type of boiler and may be used under all conditions and with any grade of bituminous coal. It may be used where space limitations make impossible installations of other types of stokers. It can be installed under old boilers as well as new and, in fact, gives efficient service under all conditions.

> Write for complete "Standard" catalog.



"Pays For Itself-Then Pays Dividends"

JONES "A-C" STOKER:

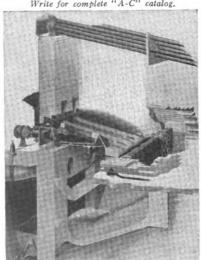


With Dump Plate in Position

With Dump Plate in Position

The Jones "A-C" Stoker is the same as the Jones "Standard" Stoker except that it is self-cleaning. The ash and refuse are automatically deposited on the dump plate at the rear as shown in the above illustration. Cleaning is not a gravity movement. This balanced dump plate is then easily dropped by hand and the ashes are dumped into the sealed ash pit below as shown. No clinkers on side or bridge walls. This stoker has the same advantages as the Jones "Standard" Stoker and in addition is cleaned automatically. cleaned automatically.

Write for complete "A-C" catalog.



With Dump Plate Dropped

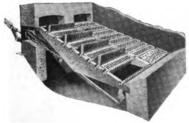
FLYNN & EMRICH COMPANY

BALTIMORE, MARYLAND

Exclusive Manufacturers of the Huber Hand Stoker and Huber Sectional Boiler Fronts

Representatives in all of the principal cities in the United States

The HUBER HAND STOKER is the pioneer hand stoker. It enables the fireman to put

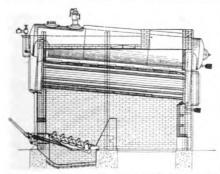


The Huber Hand Stoker

into easy operation the coking method of firing, the best known means for the efficient combustion of bituminous coal for the generation of steam. Its simplicity, ease of operation and high efficiency are responsible for its qualified success wherever installed.

The HUBER HAND STOKER has been so designed and constructed that it may be installed under any type of boiler without necessitating any change whatever in its setting and construction, merely the drilling of a few holes in the boiler front and the depressing of the ash-pit being all that is required.

Green coal is fired upon the first few stokerbars only, where it is allowed to coke; the volatile matter distilled off, passes over a bed of incandescent coke on the balance of the stoker, reducing the amount of smoke to a minimum.



Horizontal Water Tube Boiler Equipped with Huber Hand Stoker

The fuel is advanced by the movement of the stoker-bars, which are easily operated by levers at the side of the fire door. By the movement of the stoker-bars the fuel is completely broken up, finer ash is shaken through the stoker-bars and clinkers are sheared off the side walls and forwarded to the rear drop at the bridge wall. By means of the simple movement of a lever the clinkers may be periodically dropped into

the ash-pit, thus entirely cleaning the fires and making unnecessary the use of the slice bar.

The following guarantees are incorporated in the written contract of sale. When installed under boilers the HUBER HAND STOKER will:

Evaporate ten pounds and over of water per pound of coal.

Develop an over-all efficiency of 70% or over. Increase your boiler capacity from 25% to

75%. Through almost perfect combustion will eliminate smoke so as to conform with the most rigid smoke laws.

The above guarantees are based on using coal of 14,000 B, t, u, and volatile matter not in excess of 20%.

By consuming the coal with much greater efficiency, coal consumption is materially reduced. In the average plant savings in the coal bills pay for the HUBER HAND STOKER in about four months' time.

Simplicity of operation reduces the labor of the fireman and, in large installations, usually permits of a reduction in the fire room force.

The HUBER HAND STOKER, in the hands of an inexperienced fireman, can produce results of evaporation equal to and in many cases greater than those obtained from the operation of the high priced and complicated mechanical stokers and chain grates which carry initial costs of from four to five times that required for the installation of the HUBER HAND STOKER.

Old-style boiler fronts are made in one, or at most, two castings. The HUBER SECTIONAL BOILER FRONT is built up of separate and distinct castings, accurately fitted, and bolted together.



Huber Sectional Boiler Front

This sectional system minimizes breakage due to expansion and contraction and permits easy replacement of any parts which might burn or break,

Being built in sections, the HUBER FRONT is easy to ship, easy to erect and easy to repair. It represents a distinct advance in boiler front design. Built for boilers of any size or type.

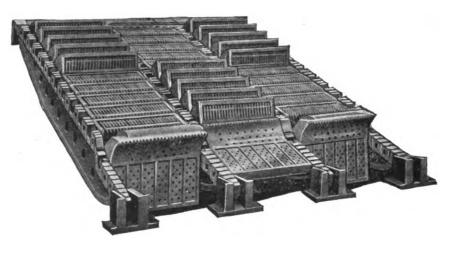
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THE FILES ENGINEERING CO., INC.

PROVIDENCE, R. I.

Manufacturers of Files Hand Stokers



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FOREWORD:

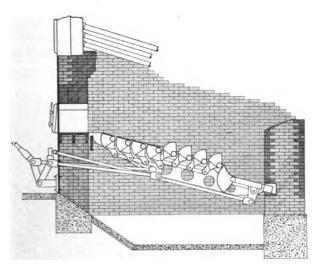
Files Hand Stokers are designed to utilize the methods by which high efficiency is obtained in large mechanical stoker installations, but where mechanical stokers are not adapted because of the expense involved to provide the necessary coal and ash handling equipment, as very often in the case of existing plants a complete remodeling of the plant is required.

CONSTRUCTION:

The stoker is designed and constructed for heavy duty and to meet unusual demands and conditions. Particular care has been given to a proper distribution of metal to combine the utmost strength and long life with ease of operation. Expansion strains have been carefully provided for and air is so directed as to provide a circulation around every part of the stoker to prevent burning or warping.

The stoker is of the overfeed type, the coal being fed into the furnace in such a manner as to effect the distillation of the volatile matter from the fuel, insuring complete combustion. Furthermore, the fire may be seen and watched at all times.

THE FILES ENGINEERING CO., INC.



SPECIAL FEATURE:

All parts of the Files Stoker exposed to the direct action of the fire are made of sections easily and economically replaced. The grate sections are made with any size air opening with a varied percentage of air space up to 50% of the total grate surface, enabling the stoker to handle anthracite, as well as bituminous coal. The grate sections may be changed without disturbing the frames of the stoker bar. The cleaning plates are counter-balanced and absolutely break off and grind down all clinker and ash deposited on them, insuring a clean fire, and, consequently, no loss of grate surface by the formation of clinker on the bridge wall. The tops of the cleaning plates are made sectional to provide inexpensive and easy removals.

DRAFT AND FUEL:

Files Stokers will operate on either natural, forced, or induced draft; while primarily designed for burning bituminous coal, they have so developed as to handle any percentage of hard coal mixtures to equal advantage. Illinois screenings, lignites, and other difficult Western coals can be burned without difficulty and high ratings and high efficiencies maintained.

INSTALLATION:

The Files Stoker can be installed in a few days or week-end without necessitating a complete shut-down of your plant, and with very little change in the present settings. When completed, the boiler fronts are not defaced with objectionable projections.

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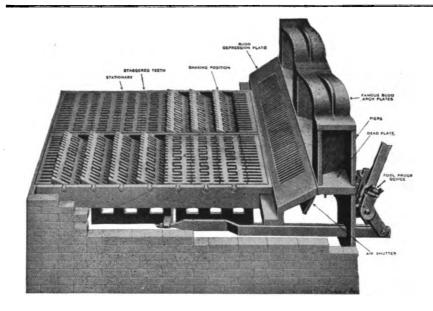
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THE BUDD GRATE COMPANY

OFFICES: 2013 E. LETTERLY ST., PHILADELPHIA, PA.

Works: Adams to Letterly Sts.

Manufacturers of Budd Boiler and Furnace Equipment
Aluminum, Iron and Brass Foundries. Machine and Pattern Works



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THE BUDD IMPROVED UNIVERSAL SHAKING GRATE AND EQUIPMENT

The above cut illustrates the Budd Equipment used in connection with the Famous Budd Universal Shaking Grate. Note the general sturdiness in the structure of the grate.

There are no complicated working parts to get out of order. The grate has a double action clinker crushing motion and is so designed as to prevent the loss of good fuel. The clinkers are completely ground up and shaken through the grate with the ash.

The fuel proof device will not permit the handle being removed unless the grates are perfectly level. It is therefore impossible for the ends of the grates to burn off.

Write for our book "Boiler Room Investment" which explains in detail or send us the size of your firebox and we will be pleased to quote you by return mail.

Let us install a set under one of your boilers for a 60 day trial and compare it with any grate you are using. If it does not give perfect satisfaction, ship it back at our expense.

BUDD BEARING METAL:

Budd Graphitic Bearing Metal is manufactured in various grades to suit your requirements.

Made to stand up under great pressure and high speed. Cheaper grades for ordinary work. All grades contain a percentage of tin which hardens the metal and insures you better service.

It is as near anti-fraction as it is possible to make a metal. Experimented with and tried for years in machinery in our own foundry.

Write for full details and prices.

WASHBURN & GRANGER, INC.

50 Church St., NEW YORK, N. Y.

BOSTON, MASS

Manufacturers of the Dean Dumping Grate, the Dean Shaking Grate, Dean Flat Suspended Arches, Dean Fire Brick Linings, Incinerators and Destructors, Boiler Fronts and Furnace Castings, Ash Hoists, Floor Plates, Turntables

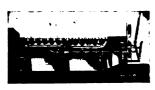
DEAN DUMPING GRATES:



Built for burning the small sizes of anthracite coal with either natural or forced draft. Bars tip in tan-

dem to an angle of sixty-five degrees and are supported at both ends by a rectangular frame which eliminates entirely the tendency of the bars to hang downward on the ends. Air spaces 1/8" to 3/8" slot and also built in the pin-hole form with 1/4" or 16" diameter openings. Fires can be cleaned in one-half the time required with stationary bars. Catalogue No. 7 on request.

DEAN SHAKING GRATES:



Used for bitum inous and the larger sizes of anthracite coal, both fuels requiring a grate with an oscillat-

ing or shaking movement. Supported by a frame resting on the ash-pit floor independent of the brick work with bars placed on 8" centers, allowing ample opening for the largest clinkers. Journals self-locking, requiring no caps. The sides of the bars are made solid which is a necessity as ninety percent of the wear comes along these edges. Construction is of the most durable form, to withstand hard service. Catalogue No. 7 on request.

DEAN FLAT SUSPENDED FURNACE ARCH:

The "Dean" flat suspended arch is designed to provide for unusual expansion and contraction and economy in main-tenance and renewal. Blocks are 9" x 12" suspended from cast iron tees and held in place with clips and bolts. The finest flint clays are used in the manufacture of these blocks, which are thor-



oughly baked and have a fusing temperature of 3200 degrees F. Each block can be renewed independent of all others and the stresses and strains incidental to all sprung arches supported by skew-backs are eliminated.

DEAN ASH HOISTS:



This hoist is built for lifting a can of ashes or other material, quickly and eco-nomically from the basement floor to the street.

It is wire-rope geared and can be operated by either air, steam or water pressure, with equal facility. The controlling valve (not shown) is of simple construction. The plunger is a polished steel tube; the cylinder is lap-welded pipe; stuffing box is of cast-iron with ample provisions for packing. It is also equipped with mechanism acting automatically upon the operating valve to

retard the speed and stop the plunger, without shock, at the extreme limits of the plunger stroke.

Complete information upon request.

INCINERATORS AND DESTRUCTORS:

We have patterns and designs for incinerators for burning rubbish and waste material, suitable for institutions, hotels, schools, apartment houses, museums, factories, etc.



We build garbage destructors of the brick set type suitable for large hospitals and hotels, and a portable type for use in large residences, clubs, restaurants, etc., designed with a steel casing and lined with fire brick to be operated with coal or gas as fuel. Send for catalog No. 9 "Incineration,"

HULSON GRATE COMPANY

GENERAL OFFICES AND WORKS: KEOKUK, IOWA

CHICAGO OFFICE: 364 Monadnock Bldg.

Manufacturers of the Hulson Grate for Stationary Boilers, Locomotives and Kilns

AIR SPACE:

55% with 3% openings, 72% with 1/2" openings. Large percentage of air space permits more perfect combustion.

SHAKING:

The journals of the finger bars are located low in the bearing bars, the tops of the fingers are curved, so that when the grate is shaken lightly its surface moves in a principally horizontal direction. This light action shreds away the fine ash without stirring or agitating the fire.

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The Hulson Grate can remove the fine ash from beneath a three or four inch slack fire without disturbing the fire bed, and without loss of live fire or green fuel. The removal of the fine ash as soon as it is formed tends to eliminate clinker formation. However, should the fire be allowed to get heavy the full throw of the grate will work all dead matter through. The full throw brings the tips of the fingers up into the dead matter, a distance of approximately two inches; they have a double cut, forwards and back which produces a tearing action on the bottom of the fire. No large opening is made to allow the fire to avalanche into the ash pit, all dead matter must be worked through the Hulson Grate. Clinkers are broken up and crushed before reaching the ash pit.



REPAIRS:

The fingers are loose on the bar held on by a key moulded on the bar. The fingers being loose, all expansion and contraction are taken care of at this point. The finger bars are so far below the fire that they are not affected by the heat. Owing to its large percentage of air space and the large amount of air travel the Hulson Grate is less liable to overheating.



The illustrations show the method of making repairs. The damaged finger is broken completely away from the finger bar. The remaining fingers are pushed over to fill the gap and the new castings applied to the shaker-arm end of the finger bar.

HULSON GRATE COMPANY

GENERAL OFFICES AND WORKS: KEOKUK, IOWA

CHICAGO OFFICE: 364 Monadnock Bldg.

Manufacturers of the Hulson Grate for Stationary Boilers, Locomotives and Kilns

The fingers can be applied with the finger bar in position. The top of the journal and the key on the shaker-arm end of the finger bar are cut away on an oblique. The finger must be tapped lightly past the key. It assumes a vertical position. The last finger cannot be removed as it is partially engaged by the key.



In a grate with a solid finger bar, should a portion of it become damaged the whole bar is lost, weighing from 50 to 150 lbs., depending on the size of the grate. With the Hulson Grate only those parts that are damaged need be replaced. The 3/8" size fingers weigh approximately one and one-half pounds, the 1/2" size, one and three-quarters pounds. Should any accident damage the finger bar proper, the bar only is lost, and none of the fingers.

The Hulson Grate rests in the furnace the same as does the old style bar grate, the front on the lip of the dead plate, the rear on the bridge-wall rest. It is made to fit present furnace measurements, the only condition being that the length over all, including rests, be a multiple of seven inches. It is made any number of sections wide to accommodate firing doors.

In making replacements the only change in brick work necessary is on the bridge wall to adjust the length measurement. The only machine work necessary is the drilling and tapping the boiler front for shaker brackets.



Grates over 70 inches in length are equipped with double shaker connections so as to shake in a front and rear sections.

Further information will be gladly furnished on request.

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4 OF

MARION MACHINE FOUNDRY & SUPPLY CO.

MARION, INDIANA, U. S. A.

Manufacturers of Shear-Klean, Marion Rocker and Scottdale Grates,
Marion Hand Stokers and Scottdale Crushers



SHEAR-KLEAN GRATES:

This is a heavy interlocking tooth grate with both a rocking and sidewise motion to the bar. This opens up the fire, removes the ash, crushes the clinker and cleans the fire without wasting coal.

136 Steel trunnions that cannot break. Deep heavy web and teeth.

Will fit any furnace using standard bars.

A High-Grade Grate.

MARION ROCKING GRATE:

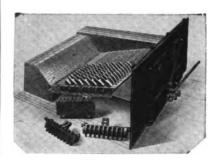
The Marion Rocking Grate is a noninterlocking tooth grate with a good rocking movement that removes ash quickly without wasting any fuel. It has deep webs and teeth and steel trunnions.



SCOTTDALE GRATES:

The Scottdale Grate is a full dumping grate with interlocking teeth. This grate has a short rocking movement that sifts out the ash, and a full dumping move-

ment that removes the clinker. Both movements controlled by the shaker attachment. Made for bad clinkering coals. Can be installed in any hand fired furnace.



MARION HAND STOKERS:

The Marion Hand Stoker is designed to burn coal by the coking method.

The coal is fired in a heap at the top of the grate and stoked down the grate by the rocking movement and a fresh charge fired. All clinker collects on the dump plate at the back, where it is dropped into the ash pit.

Designed to handle low-grade coals and prevent smoke.

SCOTTDALE CRUSHERS:

A heavy duty coal crusher that breaks up the coal into uniform size for proper firing. Built in capacities from 20 tons to 250 tons per hour. Can be adjusted to crush, coarse or fine.

Send for a copy of "MARION POWER PLANT EQUIPMENT"—a complete catalog and handbook on combustion.

MARION MACHINE FOUNDRY & SUPPLY CO.

MARION, INDIANA, U.S. A.

Manufacturers of Marion Planet Soot Blower for Water Tube Boilers, and Marion Rotary and Duplex Soot Blowers for Horizontal Return Boilers

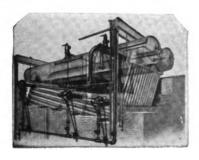
MARION PLANET SOOT BLOWERS:

This is a steam soot blower that can be installed on all standard makes of Water Tube Boilers. It is a permanent installation and always ready to use.



The Marion Planet has internally welded nozzles that will not burn off or plug up.

The Blower element is rotated by means of a reduced sprocket drive and operating wheel within easy reach of the fireman. This gives a slow, steady rotating movement to the blowing element. The very best material is used in the blower elements.





The two preceding cuts show how the Planet is installed on two typical Water Tube Boilers. Each element has a separate valve and operating wheel. All are operated from the floor level and can be used at any time.



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THE MARION ROTARY SOOT BLOWER:

The Marion Rotary Soot Blower is for H. R. T. Boilers, and is mounted in the rear wall. It has a heavy cast nozzle, with the parts controlled by a valve using only one part at a time.

MARION DUPLEX FRONT END SOOT BLOWER:

The Marion Duplex Front End Soot Blower is fully illustrated in our 68-page catalog. They are also built for Marine Boilers.

THOMAS GRATE BAR CO.

BIRMINGHAM, ALA.

BRANCH SALES OFFICES

Hippodrome Building, CLEVELAND, OHIO 276 West St., New York

Railway Exchange Building, CHICAGO, ILL.

Manufacturers of Thomas Elliptic Grate Bars for Every Fuel and Every Condition

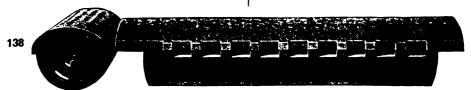


8-INCH IMPERVIOUS GRATE BAR (PERFORATED 5/8 INCH OR 3/8 INCH):

TROUBLE BEARERS—Have blocks recessed and filled with Impervious Fire Sand Cement, protecting the grate bar from the heat of the furnace with approximately one inch of cement which withstands 3400° F.

Made for all hard places burning wood refuse, sawdust, hogged fuel and shavings with natural, induced, forced draft and hollow blast grates, where there is trouble from dirt or glass clinker, or burning out of intermediate bars.

WILL OUTLAST FIRE CLAY BRICK FURNACES.



8-INCH JUMBO (PERFORATED 5 INCH OR 1/8 INCH):

For Dutch Ovens, Burning Hogged Fuels and Sawdust.

STEAM PRODUCERS—Contain 16% more grate surface in the same area. The correct way to burn wood refuse.



6-INCH ELLIPTIC (PERFORATED 5/8 INCH):

For Burning Saw Dust and Mill Refuse.

STEAM PRODUCERS—Contain 20% more grate surface in the same area. Get the heat units from the sawdust.

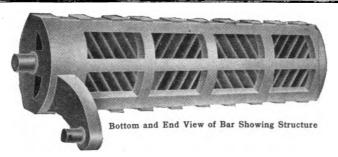


6 AND 8 INCH ELLIPTIC (CROSS RIB):

For Burning Wood, Trash, Coal and Mixed Fuels.

STEAM PRODUCERS—You can't stop up a single opening by firing, slabs, blocks, planks, or wood—keep clean fires.

THOMAS GRATE BAR CO.



THOMAS WIGGLING-SHAKING-DUMPING GRATE BARS

Fitted to Every Type of Boiler.

in

Water Tube
Return Tubular
Scotch Marine
Marine
Dog House
Locomotive
Vertical

Power Plants
Locomotives
Steamships
Dredges
Steam Shovels
Skidders
Loaders

A Bar for every condition and manipulated to suit every fuel.

Fire without Having a Cleaning Period

THOMAS



GRATE BARS

Save their cost in fuel in a few weeks' use.

Eliminate the cleaning period.

Eliminate grate bar mishaps and shutdowns.

Make a poor steaming boiler a free steamer.

Reduce the fireman's labors.

Cannot get out of fix and refuse to work.

Structure:

Is made up of two curves, one top and one bottom, joined together at each side with spacing and connecting lugs of one-third contact and two-thirds air space forming a structure in which the heat cannot equalize; the under portion cannot get hot to break or become distorted and refuse to work.

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Material:

Made of pure Pig Iron (no scrap) bought on analysis, standing 2370 degrees before fusing.

Operation:

The Elliptic shape, eccentric movement slips under the fuel or fire bed, peels the ash from its lodgment and deposits into ash pit and does not disturb the fire, tearing the fuel bed into streaks, seams, holes and pockets, as other shaker grates do.

Results:

The fire is kept at the highest state of efficiency at all times—never fouling, giving more steam and substantial savings in fuel.

For Use with Either Natural, Induced or Forced Draft.

FULLER-LEHIGH COMPANY

(Successor to Lehigh, Car, Wheel & Axle Works)

FULLERTON, PENNA., U. S. A.

Manufacturers of Pulverized Coal Equipment, Crushers, Dryers, Car Wheels and Axles, Chemical Castings, Special Castings in Green Sand or Loam, Etc.

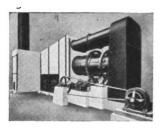
PULVERIZED COAL EQUIPMENT: Superior in

Design Efficiency Performance



Lehigh Crushing Rolls

We are in position to furnish all the various units used in connection with furnaces heated by means of pulverized coal. At the present time our Pulverized Coal Equipments, consisting of Lehigh Crushing Rolls, Indirect Fired Rotary Dryers, Fuller-Lehigh Pulverizer Mills, Pulverized Coal Feeders, and Fuller Quality Sprocket Wheels, are in-



Indirect Fired Rotary Dryer

stalled in plants having a capacity of 25,000 tons of pulverized coal per day. These plants are widely distributed and



Fuller Mill, Pulley Driven



Fuller Mill, Gear Driven

are pulverizing coal obtained from a large number of fields in various coal-producing districts.

The types of furnaces heated with Pulverized Coal are quite diversified, and we enumerate here some of the furnaces at present heated by means of this most economical and efficient fuel in order to convey some idea of the wide application of Pulverized Coal for heating various types of Industrial Furnaces.



Pulverized Coal Feeder

Annealing Furnaces
Bar Heating Furnaces
Billet Heating Furnaces
Calcining Furnaces
Drying Furnaces
Forge Furnaces
Locomotives
Nodulizing Furnaces
Open Hearth Furnaces
Ore Roasting Furnaces
Piled Scrap Heating Furnaces
Puddling Furnaces
Rotary Cement Kilns
Rotary Lime Kilns
Steam Boiler Furnaces, Marine and

Send for Illustrated Catalogue No. 72.

Land Type



Face Hardened Sprocket Wheels

QUIGLEY FURNACE SPECIALTIES COMPANY, INC.

MAIN OFFICE: 26 CORTLANDT ST., NEW YORK CITY

BRANCH OFFICES:

Munsey Bidg. BALTIMORE

Ellicott Square

Oliver Bldg. PITTSBURGH, PA.

Real Estate Trust Bldg. PHILADELPHIA

Dry Milling Engineering Co. DENVER, Colo.

Engineers, Designers and Contractors. Complete Powdered Coal Equipments, Including Furnaces

Also Makers of HYTEMPITE Furnace Cement

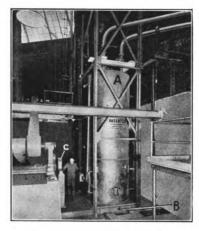
QUIGLEY PATENTED SYSTEM OF POWDERED COAL EQUIPMENT:

In the Quigley System of preparing, transporting and burning powdered coal, the powdered fuel is automatically weighed as sent to the furnace bins. Transportation of the fuel is through wrought pipes to the furnace bins which may be in widely separated departments.

The system of distribution consists of pipes with switching valves conveniently located, the turning of which diverts the coal to bin or bins as desired. These bins are located at the furnaces with an ample fuel supply for 10 to 24 hrs. The controller used to regulate the fuel feed is of simple design having only two working parts but is positive in action. By turning a hand or chain wheel, absolute control of fuel fed to burners is obtained.

The fuel is fed by the controller into a low pressure air system which carries the fuel into the burner where it is mixed with the larger volume of combustion air at a pressure just above atmosphere, thus securing the lowest velocity and most perfect combustion.

Safety, reliability and freedom from floating dust are features of this system.

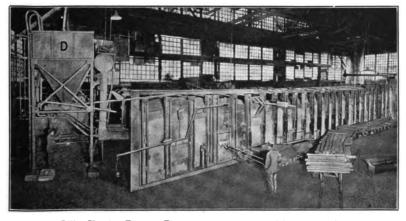


Powdered Coal Blowing Tank

A—Blowing Tank C—Scale Dial

B—Scale Platform D—Furnace Bin

Send for Bulletin No. 11 describing complete system with illustrations of plants now in successful operation.



70 Foot Billet Heating Furnace Fired with Powdered Coal by the Quigley System
(See page 153 for additional products of this Company)

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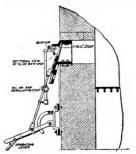
W. N. BEST, INC.

11 Broadway, NEW YORK

Engineers in Caloric: Liquid Fuel Equipment; Furnaces for Heating, Melting and Heat Treatment of Metals. High Pressure, Low Pressure, Volume Air, Air Carburetting and Mechanical Burners of All Sizes

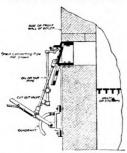
W. N. BEST CALOREX EQUIPMENT:

MAKE YOUR POWER PLANT DEPENDABLE. IF YOU ARE AT PRESENT BURNING COAL, INSTALL OIL AT ONCE AS AN EMERGENCY FUEL, AS A CERTAINTY FOR MEETING PEAK LOADS WITH THE CALOREX EQUIPMENT.



Burner in Position for Use

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Burner Shut Off and Opening in Furnace Wall Closed

For burning oil or tar in combination with coal in either hand-fired or stoker-fired boilers, or in bagasse-fired boilers using oil exclusively or coal exclusively, or bagasse exclusively; or can be used to quickly double or triple the rating of the boiler by using the oil or tar in combination with coal, breeze or bagasse. Simple of operation. Easily installed. Any man of ordinary intelligence can learn to operate it in ten minutes.

We believe no power plant in which coal is used as a fuel is safe today without liquid fuel equipment for use either in combination with coal (where coal is cheap and the oil is high) or for the use of oil exclusively as fuel when necessity

demands. The use of liquid fuel elevates the mind of the fireman, for it is a science, while the burning of coal necessitates brawn rather than brains. This fuel also gives the man in the boiler room confidence, for he knows his ability to meet the fluctuating loads, no matter what may be the climatic conditions, winter or summer.

In many power plants the W. N. Best Calorex Liquid Fuel System is used in combination with coal to carry the peak loads demanded of the boiler, a few hours in the morning and for a few hours in the afternoon or whenever the power is intermittent. This invention, lately patented by Dr. W. N. Best, is a model of simplicity, durability and efficiency in securing and maintaining CO₂ from the fuel in the firebox of boiler when burning oil exclusively or when burning coal in combination with oil. If it is desired to operate the boiler with coal only, the flow of oil through the burner is stopped by the operating valves as shown in cut, and the slide gate is closed which can be done in a quarter of a minute. The air for combustion is admitted below the sheet of flame immediately under the burner in the accurate, regulated quantities required for the perfect combustion of the oil. The air damper can be so regulated by the lever on the quadrant as to insure accurate regulation either at maximum or minimum capacity.

In gas works where considerable watergas tar is made as a by-product, with this invention this is a very superior fuel because of its high calorific value when thoroughly atomized. This tar can be burned either in combination with the coal or breeze, or can be used exclusively as fuel. When the supply of tar is ex-hausted, the burner is shut off by means of the valves and the slide gate is closed, which hermetically cuts off the outer air as well as seals the opening in the side wall of the boiler, after which coal can be burned in the boiler exclusively in the usual manner. When a supply of tar has again accumulated, the burner may be again operated in the usual manner.



We have some interesting literature we will send gratis.

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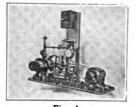
S. T. JOHNSON CO.

1337 Mission St., SAN FRANCISCO, CAL. GRACE AND LOWELL STS., OAKLAND, CAL.

Manufacturers of Oil Burning Equipment

A SPECIAL BURNER For Each Need

Fig. I-Illustrates an S. T. JOHNSON CO. low pressure, air crude fuel oil, burning equipment suitable for operating steam boilers, hotel ranges,



bake ovens, etc. Described in our Bulletin No. 12.

Fig. 2-Illustrates an S. T. JOHNSON Rotary CO crude fuel oil burner suitable for operating steam boilers, water heaters. etc. Described in our Bulletin No 28.

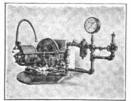


Fig. 2

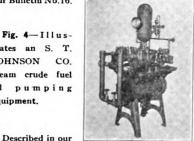
F i g . 3-Illustrates an S. T. JOHN-SON CO. Whirlwind Burner suitable for burning 28 degree baumé oil or better in all



Fig. 3

types of furnaces, etc. Described in our Bulletin No.16.





Bulletin No 27A.

Fig. 4

Fig. 5-Illustrates an S. T. JOHNSON CO. Rotary burner installed in Cast Iron steam boiler for heating apartment houses, residences, etc. Described in our Bulletin No. 28.

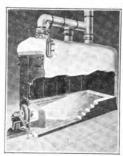
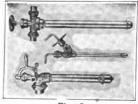


Fig. 5

Fig. 6—Il-lustrates S T. JOHNSON CO. air and steam atomizing burners, (a) steam burner large boilers, etc., (b) steam



etc., (b) steam
burner suitable for ranges
and small
boilers, (c) S.
T. JOHNSON
CO. low pressure air crude fuel oil, atomizing
burner.
Described in our Bulletins No. 12 and burner. No. 27A.

Fig.7-Illustrates an S. T. IOHNSON CO. crude fuel oil, pumping equipment. Described in Bulletins No. 16 and 28.

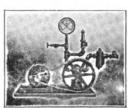


Fig. 7

Fig. 8-Illustrates an S. T. JOHNSON Whirl-CO. wind Oven burner suitable for operating all types of inside firing bake ovens.



Fig. 8

The S. T. JOHNSON CO. are the manufacturers of the most complete line of oil burning equipment on the market.

For further information write for Bulletin describing equipment interested in.

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A. M. LOCKETT & CO., LTD.

Contracting Mechanical Engineers

MANUFACTURING AND GEN. SALES OFFICES AT

NEW ORLEANS

SALES OFFICES AT

Houston, Tex. HAVANA, CUBA

FORT WORTH, TEX.

SHREVEPORT, LA.

ATLANTA, GA.

SAN JUAN, P. R.

NEW YORK CITY

THE LOCKETT OIL-BURNING EOUIPMENT as manufactured today represents the experience gained by our Engineering Organization over a period of twenty years in the efficient burning of various grades of liquid fuel.

This experience embraces not merely the design of the apparatus but also 144 close contact with actual results obtained in service, and so enables us to modify our apparatus to suit the changing character of liquid fuels being offered.

The Lockett equipment has been made as simple and rugged as possible with a minimum of parts and at the same time the materials used in this equipment are the best of their respective kinds, so that we take a pardonable pride in offering to our customers apparatus suitable in each case for the work for which it is sold.

We have made a special study of the proper furnace design and oil heaters for efficiently burning the heavier Mexican oils in various types of boilers.

We are prepared to quote on the equipment for any particular case or on complete installations for either stationary or marine work.

Our new booklet "A. M. L. 106" gives information of general interest on the subject of Oil Burning as well as describing some of our products. Copy will be furnished on application.

We manufacture:

Lockett Automatic Oil-Pumping Sets in standard sizes from 100 to 10,000 H. P.

Lockett and Babcock and Wilcox Flat-Flame Steam Atomizing Oil Burners.

Nelson Porcupine Type Multi-Pass Oil Heaters.

Lockett Oil Strainers.

Special High-Pressure Pumping Sets for Marine use.

We are also prepared to quote on oil burning apparatus for special conditions.

M. H. DETRICK CO.

549 W. WASHINGTON ST., CHICAGO, ILL.

Manufacturers of Flat Suspended Fire-Tile Arches

DISTRICT SALES OFFICES

CHICAGO
PHILADELPHIA
ATLANTA

MILWAUKEE PITTSBURGH SAN FRANCISCO DETROIT BOSTON SEATTLE CINCINNATI INDIANAPOLIS HOUSTON CLEVELAND SALT LAKE CITY HAZLETON, PA. NEW YORK
NEW ORLEANS
BUFFALO

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DETRICK FLAT SUSPENDED ARCHES:

Applied to All Types of Boilers and Stokers

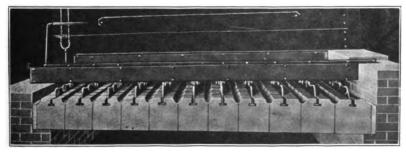
The freely suspended individual tiles can move under expansion stress, thereby relieving the side walls from side thrust entirely. Tiles may be removed and replaced without disturbing the balance of the construction. The flat under surface provides a more uniform distribution of the gases and maintains a higher temperature for the burning of the mixture of air and volatile gases.

The end construction shown in the accompanying view is a unique feature in providing the following essentials:

- 1. Practical apron wall support.
- 2. Flexible construction, allowing easy repairs.
 - 3. Unit system of suspension.

There is a reason why over 1,500,000 boiler horse power are equipped with Detrick Flat Suspended Arches.

Descriptive Literature on request.



Front View of Detrick Flat Suspended Arch

DRAKE NON-CLINKERING FURNACE BLOCK CO.

INCORPORATED

5 BEEKMAN STREET, NEW YORK

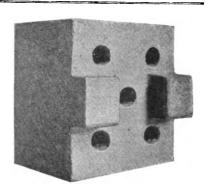
Manufacturers of Drake Non-Clinkering Furnace Block

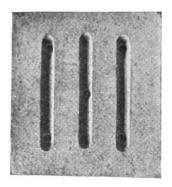
WHY Do Drake Blocks Make Clinker Formation a By-gone?

The illustrations show how and why.

A study of these illustrations of DRAKE BLOCKS only emphasizes their worth in modern engineering practice. They successfully meet the needs of the hour. Remember DRAKE BLOCKS are applicable to all kinds of furnaces; can be thoroughly bonded together and easily installed. The assistance and intelligent coöperation of our engineers is yours, without incurring any obligation.

- Fluted construction positively prevents clinker formation. Proper amount of air supply is afforded at all times.
- Increased jet velocity reduces friction by means of tapered air nozzles.
- Air duct formed by lugs on back, within 9" lining, makes a solid, substantial furnace lining.
- Area of holes is designed for a positive supply of air, proportionate to the rate of combustion.





(Patents Pending)

Your Request to Us or Our Nearest Branch Brings All Details.

Agencies in Principal Cities.

LIPTAK FIRE BRICK ARCH CO.

846 Builders Exchange, MINNEAPOLIS, MINN.

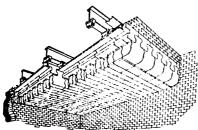
Manufacturers of Liptak Double Suspension Fire Arches

THE LIPTAK ARCH:

Every arch problem, physical or financial, can be successfully solved by Liptak Arches. They are developing thousands of additional horsepower and have never yet forced a boiler off the line because of arch troubles.

CONSTRUCTION:

Without a tool of any description Liptak Double Suspension Arches can be easily erected at any angle desired. Cast iron brackets are slipped on steel "I" beam supports; into these brackets special T-shaped cast iron hangers are placed.



Onto this cast iron framework the "Reserve" arch, or your second defence arch, is hung.

This arch is your factor of safety and enables you to use 100% of the main arch (next to the fire) and then continue until it is convenient to shut down. Pause a moment and mentally picture what this would mean to you.

The main arch is suspended from your reserve arch and so designed and constructed that there is no grooving of the joints with your hot gases, nor is there any flame leakage, the blocks cannot shift, and no cement or fire clay is needed.

Between the main and reserve arch and the cast iron hanger there are two dead air spaces, nature's best nonconductor of heat-making it possible for one to stand barefooted on the top of the arch in perfect comfort.

FOURTEEN GOOD REASONS WHY YOU SHOULD USE LIPTAK ARCHES:

- Absolute dependability. No forced shut-downs.
- 2 Longer life.

Fewer repairs and interruptions to production.

- 3. Air-tight, consequently heat-tight. Better combustion.
- Double suspension.
 - Insurance against burned-out iron work.
- 5. Interlocking blocks.
- No heat waste and no fire clay joints.
- Insulating dead air spaces.

 Cool boiler room—fuel economy.
- Broken joints. fire travel, preventing fire Staggering grooves.
- No fire clay exposed to fire. Easier to repair. No fire or expansion cracks.
- 9 Accessible blocks.
- Independent apron wall. Two arches protect apron wall sup-ports against fire.
- 11. Highest grade refractory materials used.
- 12. No tools or forms necessary to erect iron work or arch blocks.
- Withstands highest temperatures. 13.
- Iron work protected so it is cool at all times.

14. Cheapest in the long run.

Lower upkeep cost than any other arch.

HOW MUCH DOES YOUR ARCH COST:

Five factors at least should be considered when purchasing mechanical equipment:

- (1) Maintenance.
- (2) Loss (in terms of your product) due to possible breakdowns.
 - (3) Life or rate of depreciation.
- (4) Annual sinking or replacement fund necessary.
 - (5) First cost.

Liptak Arches have the lowest possible maintenance cost. They have no unexpected breakdowns-you may always shut down for arch repairs at your convenience. The years of service from Liptak Arches are legion, therefore the annual sinking fund necessary for replacement is unnoticeable. To get these advantages first cost was a minor consideration when Liptak Arches were being developed. We strove for the best and now offer you the best and relatively the cheapest fire arch obtainable.

Write, enclosing a blue print or sketch of your furnace, and we will gladly give your problem detailed consideration.

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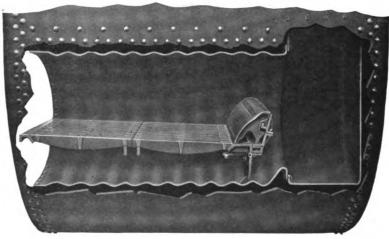
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WAGER FURNACE BRIDGE WALL COMPANY, INC.

149 BROADWAY, NEW YORK CITY

Manufacturer of Wager Patent Furnace Bridge Wall



Sectional View of a Boiler Showing Complete Installation of WAGER BRIDGE WALLS and Furnace Fittings

YOU DON'T HAVE TO PAY FOR WAGER BRIDGE WALLS—THEY PAY FOR THEMSELVES:

The above is an extract from a letter recently received from one of the oldest users of our equipment and has a world of meaning to those who believe with us that efficiency in the final analysis is reflected in dollars and cents.

The WAGER BRIDGE WALL is an investment and not an expense, as it will save many times its cost during its life. Our engineers are prepared to prove this to your satisfaction. May we ask for the opportunity?

Note the absence of studs through

furnace, thereby eliminating the necessity of drilling holes.

The entire weight of the Bridge Wall is supported on a base casting conforming in curvature to lower half of furnace, which distributes weight evenly and prevents undue stress or strain at any particular part of the furnace.

One of the exclusive features of the WAGER BRIDGE WALL consists of back plates covering the entire rear face of sections, which not only protects the Bridge Wall sections from fire and ashes in combustion chamber, but causes the air to flow to the crest of the Bridge Wall, preventing excess air from leaking through the Bridge Wall sections into the combustion chamber.

Send for Descriptive Booklet A-S.

CELITE PRODUCTS COMPANY

NEW YORK, 11 Broadway PHILADELPHIA, Liberty Bldg. PITTSBURGH, Oliver Bldg. CLEVELAND, Guardian Bldg. DETROIT, Book Bldg. CHICAGO, Monadnock Bldg. St. Louis, 1532 Olive St. Los Angeles, Van Nuys Bldg. San Francisco, Monadnock Bldg

DESCRIPTION:

Sil-O-Cel is used to prevent heat penetration. It is produced in brick, blocks, powder and cement forms from Celite, a mineral extremely light in weight and possessing unusual heat insulating qualities.

SIL-O-CEL INSULATING BRICK:

Made in standard fire brick sizes and are used as an insulating backing for the refractory in all types of high temperature. equipment.

SIL-O-CEL BLOCKS:

Made in sizes 6×18 ", 1, $1\frac{1}{2}$, 2 and 3" thick. They are a bonded form of Sil-O-Cel suitable when a high temperature insulation is required in large sections.

SIL-O-CEL INSULATING POWDER:

This form has the same insulating qualities as Sil-O-Cel Brick but is used where brick is not adaptable for insulating, such as hot blast stoves, gas generating equipment, doors of ovens and boilers. It is also used for fire-proofing and sound-deadening in building construction.

SIL-O-CEL C-3:

A semi-refractory material of high insulating value, prepared in granular form. When suitably bonded by the addition of 20 per cent by volume of Portland Cement (process patented) and moistened slightly, this material is ideal for insulating furnace bases, doors, etc. The mixture should be rammed into place.

SIL-O-CEL C-22 BRICK:

A semi-refractory type of Sil-O-Cel Brick made in standard fire brick sizes. Being free from shrinkage at high temperatures, will not spall with sudden temperature changes. These brick are recommended as an intermediate insulating course for the protection of the insulation under extreme temperature conditions.

SIL-O-CEL INSULATING CEMENTS:

Are adaptable for the insulation of irregular surfaces or in places where other Sil-O-Cel products are not adaptable. They are prepared in three coats and applied as follows:

Sil-O-Cel Sticking Cement (First Coat) is used to produce a surface to which the second, or insulating coat, will adhere.

85% Sil-O-Cel Insulating Cement (Second Coat) is the insulating coat, having unusually high insulating value and durability under heat.

Sil-O-Cel Hard Finish Cement (Third Coat) is used to give the work a smooth, hard, durable finish.

CELITE HIGH TEMPERATURE CEMENTS:

Celite High Temperature Cements are mixtures of ceramic materials, scientifically compounded



for laying, facing and patching fire brick work in boiler settings, furnaces, etc. They set up under the action of heat, making a bond structurally as strong as the fire brick with absolutely no shrinking or swelling. Celite High Temperature Cements bond the refractory together, making a solid monolithic structure.

Sil-O-Cel Insulating Products will prevent heat loss and increase the output of the equipment, save fuel, better working conditions and insure more accurate control of temperatures. They are applicable to:

Annealing Purnaces
Annealing Pits
Bakers' Ovens
Boiler Settings
Bustle Pipes
Chill Rooms
Coke Ovens
Core Ovens
Crematories
Crucible Furnaces
Dryers
Dust Catchers
Electric Furnaces
Enameling Ovens
Forewarmers
Foundry Ladles
Gas Generators
Gas Producers
Glass Lehrs
Gun Furnaces
Heat Treating Equipment
High Temperature
Flues

Hot Blast Mains
Hot Metal Cars
Ingot Molds
Incinerators
Japanning Ovens
Kilns
Lead Pots
Hot Blast Stoves
Malleable Furnaces
Melting Pots
Metal Mixers
Oil Fired Furnaces
Oil Stills
Pipe Covering, Etc.
Pre-Heaters
Regenerators
Soaking Pits
Soap Kettles
Spelter Pans
Sulphur Burners
Tunnel Kilns
Waste Heat Boilers
Water Gas Sets

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Boiler Side Wall Insulated with Sil-O-Cel Insulating Brick
ENGINEERING SERVICE:

An engineering department is maintained for the purpose of providing additional data and will gladly give the benefit of their experience in working out any specific problem which may confront you.

Bulletins containing Engineering Data on any of the above types of equipment will be sent on request.

CRESCENT REFRACTORIES COMPANY

CURWENSVILLE, CLEARFIELD COUNTY, PA.

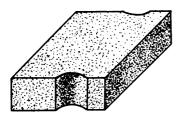
PLANTS-CURWENSVILLE, PA.-LUMBER, PA.-CLEARFIELD, PA.

Manufacturers of Fire Clay Brick, Linings, etc.

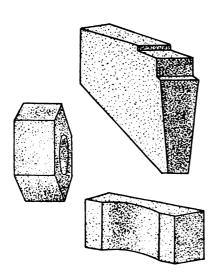
HIGH GRADE CLEARFIELD COUNTY FIRE CLAY REFRACTORIES:

BRANDS:

- "Crescent"
- "Liberty"
- "Lumber City"
- "Rockton"
- "Suskana"
- "Bick"



150



CAPACITY:

275,000 Nine-Inch equivalent daily.

PRODUCTS:

Blast Furnace Linings

Boiler Settings

Brass Furnace Materials

Calcined Flint Clay Grog and Dust

Cement Cooler Linings

Cement Rotary Linings

Clinker Rotary Linings

Coke-Oven Regenerator Linings

Core Oven and Annealing Furnace Brick

Crucible Furnace Linings

Crude Crushed Flint and Soft Clays

Enameling Furnace Linings

Forge Furnace Linings

Gas Producer and Flue Linings

Glass Furnace Regenerator and Lehr Linings

Heating Furnaces, clay refractories only

High Duty Special Shapes

Hot Blast Stove Linings

Iron Cupola Linings

Ladle Liners

Malleable and Air Furnace Materials

Open Hearth Regenerator Materials

Puddling and Busheling Furnace Brick

Refractory Ground and Batch Clays

Soaking Pit Materials

Stove and Furnace Pipe

Linings

Vertical and Rotary Lime

Kilns



JOINTLESS FIRE BRICK CO.

1130 to 1150 CLAY St., CHICAGO, ILL.

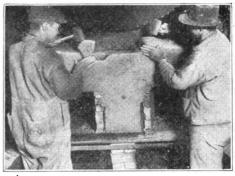
We warehouse our material in all principal cities for prompt delivery

PLINES

A High Grade Refractory for Furnace Linings, Baffles, etc.:

- 1. It's jointless.
- 2. It's plastic.
- 3. It's air and gas tight.
- 4. It will stand 3100° F.
- 5. It will save fuel.
- It can be installed by inexperienced labor.
 - 7. It will outlast fire brick.
- 8. It can be used in any boilerfurnace or oven.
- 9. It can be used wherever fire brick is used.
- 10. It cannot be equaled for patching. INSTEAD OF first baking fire bricks and laying them up with fire clay joints,

WE APPLY our putty form PLIBRICO (fire brick material), shape it not less than 4½ inches thick, and then bake it out in a one-piece monolithic vitrified finished



Showing How Easy It Is Installed and Made to Fit Any Shape

furnace lining without any joints, and making the fire brick setting air and gas tight.

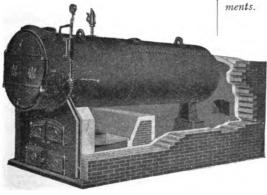
ANY ENGINEER can see the economy and efficiency of such a lining.

IT PUTS your boiler in "Class A-1."

Try Plibrico on your front door arches and bridge walls or side walls, and we are certain that the economy demonstrated will induce you to use PLIBRICO wherever possible in your plant.

Write for our book and send us your blue prints so that we may estimate on your furnace require-







TRADE MARK
Reg. U. S. Pat. Office

KING REFRACTORIES CO., INC.

MAIN OFFICE AND WORKS

1709 NIAGARA ST., BUFFALO, N. Y.

Offices in Principal Cities

Manufacturers of Flame Brand High Temperature Cements

BLUE FLAME FIRE BRICK CEMENT is a carefully compounded high temperature cement made of the highest grade refractory materials obtainable and is used for laying up any make or shape of fire brick. It especially is adapted for the building of boiler, reverberatory and other types of high temperature furnaces. It is highly recommended for use when setting baffles, door jambs, arches and blocks of any design. BLUE FLAME CEMENT can be fired while damp and will not crack or craze, does not disintegrate on drying or with age and fluxes on the face of joints and when fluxed it forms a gastight joint, preventing infiltration of cold air and the diluting of gases of combustion, thereby increasing the boiler and furnace efficiency.

152

RED FLAME (DRY) PLASTIC CE-MENT: A carborundum mixture made from the very best heat-resisting materials and is particularly adapted for laying up fire brick arches and protecting the surface of fire bricks in boiler and other types of furnace setting.

This cement when mixed with old

burnt, crushed fire brick (ganister) will make a solid monolith and the material being plastic, may be used to form all parts of furnace linings, including front wall door arches, side walls, arch construction (where used); also for lining fire and clean-

out doors. This makes an ideal material for foundry work, such as lining crucible furnaces, annealing, heat treating, case hardening, tempering, forging and pot furnaces, etc.

WHITE FLAME INSULATING CE-MENT is manufactured from the best insulating and non-conducting products and is used for covering all exposed heating surfaces in Power Houses where high pressure steam is generated and superheat used, such as covering boiler shells, drums, heads, feed water heaters, valves, pipes, fittings, digesters, gas engine exhausts, etc., also for insulating purposes between brick work and metal jackets on boilers and retorts, roofs of projected and extended furnaces.

For our mutual protection Flame Brand
Cements are tested twice a month by
Pittsburgh Testing Laboratory to assure us uniformity
of quality.

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QUIGLEY FURNACE SPECIALTIES COMPANY, INC.

26 CORTLANDT ST., NEW YORK

Manufacturers of HYTEMPITE Furnace Cement Also Quigley System of Powdered Coal Equipment

THINGS YOU SHOULD KNOW ABOUT

HYTEMPITE

What is it?

HYTEMPITE is a scientifically compounded refractory plastic material for bonding fire brick and for kindred uses.

What does it do?

HYTEMPITE forms a lasting union between the materials to be joined, sets at normal temperatures and retains its strength regardless of the heat it is subjected to up to about 3000° F. or a temperature at which the best quality fire brick loses its strength and becomes soft.



In the Power Plant: Hytempite for Laying up Boiler Settings



Lining of 50 Ton Steel Ladle Laid up with Hytempite

Why is it better than fire clay?

HYTEMPITE is better than fire clay because fire clay and water has no binding strength, does not support the brick work or knit together the materials with which it is used, comes loose from a constant expansion and contraction, disintegrates or falls out, forming crevices or cracks and does not maintain a gas- or air-tight structure.

Does it depend on heat for a bond?

No, HYTEMPITE air sets at normal temperatures, making a wall of uniform strength throughout.

Will it stop or prevent air and gas leaks?

Yes, HYTEMPITE will not only stop these leaks, but will withstand the expansion and contraction caused by heat without loosening.

What proves its merit?

Over 80% of its sales are repeat orders.



In the Brass Foundry: Lining and Repairing Pit Furnaces

153



In the Gas Plant: Patching Cracked Retort with Hytempite

What are some of its uses?

. For laying fire brick and tile.

2. For tightening old walls and arches, sealing openings in new walls, stacks, etc.,

ing openings in new walls, stacks, etc., to make them air-tight, lining doors, etc.

3. Hot patching in furnaces, gas retorts, etc.

4. Making special tile and shapes with crushed old fire brick, Carbosand, Ganister, etc.

5. Moking rammed in linings with

5. Making rammed-in linings with your crushed old fire brick, Carbosand, Ganister, etc.

Bonding new courses or a veneer of fire brick to old walls.

Preventing leaks between bricks and iron

work.

8. As a wash for surfacing brick

work. 9. As a grout diluted or neat,

according to requirements.

10. For lining ladles.

11. For patching or building up tuyeres, etc., etc.

SEE OUR ADVIS IN MECHANICAL ENGINEERING

(See page 141 for additional products of this Company)

LOOMIS-MANNING FILTER DISTRIBUTING CO.

MAIN OFFICE: 1439 So. 37th Street, PHILADELPHIA, PA.

BRANCH OFFICES IN NEW YORK, BOSTON, BALTIMORE

PRODUCTS:

Filters for cleansing and purification of water. Water rendered bright, clear, free from matters in suspension, free from odor, taste or iron stain and safe for all purposes.

DESIGN OF LOOMIS-MANNING FILTER:

It is evident that a filter must be able to cleanse the filter bed thoroughly, ridding itself of the matters extracted from the water in the process of filtering.

This thorough cleansing is accomplished by passing the filter bed through the Loomis Cutting Plate by reversing the current of water through the filter. The action is shown by the cuts below. The bed then agitates in a space twice as great as it occupied when filtering. The filtering material is a uniform size from top to bottom and every particle is in motion when washing.

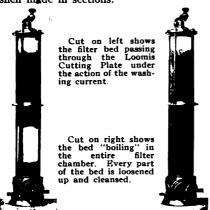
This filter is also unique because the filter bed rests on a sand light screen system extending over the whole area of the filter chamber. This makes the filtration (and also washing) uniform over and throughout the entire filter bed.

CONTROL OF FILTER:

The cleansing is brought about by moving one lever operating the Manning Single Controlling Valve. Control is accurate and sure.

SUBSTANTIAL CONSTRUCTION:

Outside shell, stands and grates supporting screens are cast iron. Outside shell made in sections.



Manning Single Controlling Valve, solid bronze throughout.

Loomis Confining Plate, placed at top, prevents entrance of large matters and loss of filter bed when washing. Loomis Cutting Plate, to make cleansing effective (see cuts). Screens at bottom, supporting filter bed, are sandtight.

All plates and screens, perforated copper reinforced by cast iron grates.

Piping, galvanized iron or brass, as desired.

Filtering material, finest grade of crushed quartz sand or specially prepared bonechar to meet water conditions.

Filters tested for 100 lbs. pressure. Special construction for higher pressures if required.

Workmanship, expert and accurate.

SIZES, CAPACITIES, ETC.
Style L, Single Cylinder Filter and Style M,
Double Cylinder Filter*

Filter No. Style L or M	Inlet and outlet, inches	Waste, inches	Capacity, gals. per minute
17 27	15	1,5	1½- 3 2 - 4
37 47	114	*	4 - 8 6 - 12
57 67		1	8 - 16 11 - 22
77 87	21/2	11/2 2 3 3 3	15 - 30 25 - 50
97 107 112	4	3	50 -100 75 -150
117	5	4	100 -175 125 -200

* Capacities depend on condition of unfiltered water and the requirements of service. Double Cylinder filter has not a greater capacity than same size Single Cylinder filter, but gives greater refinement and removes odor, taste and iron stain.



Style L Single Cylinder

Style M Double Cylinder

STANDARD WATER SYSTEMS CO.

HAMPTON, N. J.

Engineers and Manufacturers

NEW YORK OFFICE: 50 Church Street, New York City

Manufacturers of Standard Multi-coil Evaporators and Multiple Effect Plants, Standard Multi-coil Feed Water Heaters, Standard Multi-coil Distillers, Fuel Oil Heaters, Grease Extractors, Condensers, "Tripure" Aerated Water Stills for Land and Marine purposes.

SALT WATER DISTILLATION:

On shipboard, or in stationary plants, where sea water is distilled, the "STAND-ARD" method of distillation is ideal. The salt water is rendered absolutely pure, free from salt and all other impurities, and where the water is to be used for drinking purposes, it is made deliciously sweet and palatable by our patented method of aeration.

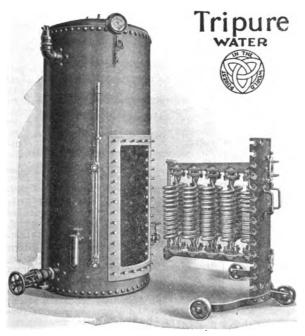
"TRIPURE" apparatus is specially designed for steamships and harbor vessels.

In our multiple effect plants for steam-

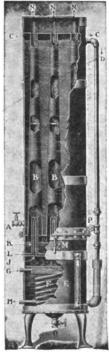
ers, etc., we produce water at exceedingly low cost, which makes it practical and economical for boiler feed. Water from the last effect is introduced to our Aerating Condenser, thereby being made desirable for drinking purposes. Such a system is installed at Quarantine, Port of New York.

TRIPURE WATER STILL: (patented)

Entirely automatic in operation. Built in various sizes and capacities from 125 to 5000 gallons of distilled and aerated water per day.



Standard Multi-coil Evaporator, with entire heating unit withdrawn for internal inspection or cleaning. Facilitated by our patented RADIAL door.



Tripure Water Still

155

THE REFINITE COMPANY

REFINITE BLDG., OMAHA, NEB.

Manufacturers of Refinite Water Softeners and Refinite Rapid Pressure Filters Booth Lime—Soda Water Softeners

DISTRICT OFFICES

CHICAGO BRANCH, SPECIAL DISPLAY SALESROOMS, 908 So. MICHIGAN AVE.

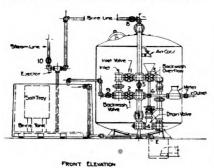
New York—1116 Nat'l Association Bldg., 23 W. 43d St.
ATLANTA—320 Hurt Bldg.
CINCINNATI—410 Traction Bldg.
MINNEAFOLIS—703-4 Plymouth Bldg.
BUFFALO—411 Liberty Bldg.

ST. LOUIS—438-439 Boatmen's Bank Bldg. DENVER—500 Mercantile Bldg. SPOEANE—1015 Old National Bank Bldg. SAN FRANCISCO—419 Call Bldg. Los Angeles—303 Story Bldg.

THE REFINITE WATER SOFTENER is a system by which 100% perfect soft water can be secured without the direct addition of chemicals.

It is of the Pressure Filter Type, consisting of a closed cylindrical shell of steel, fitted with valve nest and piping, enclosing a bed of **Refinite**. **Refinite** is a natural mineral of the zeolite class, mined near the Black Hills of South Dakota. It has the property of replacing calcium and magnesium from compounds in solution by sodium.

Raw water enters at the top of the container and passing down through the bed of mineral is relieved of all lime and magnesium. Softened to an absolute no-hardness, the water flows out of the container through a carefully designed strainer system at the bottom.



As illustrated, connections are provided to a tank containing a solution of common salt. After the Refinite mineral has softened its rated capacity, this salt solution is run into the softener and allowed to stand in contact with the mineral for six or eight hours. The sodium of the salt replaces the lime and magnesia removed from hard water during the run.

The calcium and magnesium chlorides are then wasted to the sewer, the washing continuing a few moments until all traces of salt disappear and the mineral is again ready for softening. This regeneration can be repeated for years without marked depreciation of the mineral. Furthermore, it does not interfere with the regular operation of the softener as the regeneration can be done at night or any other time when the softener is not in use. The process requires no attention except for the initial opening and closing of the proper valves.

The following equation shows the typical reaction of the softening process (the complex molecule of the zeolite is represented by the formula Na₂R, Sodium Refinite):

 $\begin{array}{l} (CaCO_3)(MgCO_3)(CaSO_4)(CaCl_2) + Na_2R \\ = (Ca)(Mg)R + (Na_2SO_4)(Na_2CO_3)(NaCl) \\ (Dissolved \ in \ water) \end{array}$

Reaction illustrating regeneration: $(Ca)(Mg)R + 2 NaCl = (Ca)(Mg)Cl_2 + Na_2R$

Refinite, being a natural zeolite, is not sensitive to the presence of small quantities of free carbonic acid gas in water. It is less sensitive for the same reason to the presence of iron, has greater softening capacity pound for pound and weighs more per unit of space occupied. The softener is, therefore, extremely compact, occupying very little space and the mechanical construction is most simple.

Normal variations in the composition of water do not affect the results of treatment.

The Refinite Softener requires little attention and no technical knowledge to operate. The only operating expense is the small cost of salt for regeneration.

Refinite Softeners are built in fifteen sizes. Their dependability in supplying absolute no-hardness water at all times is responsible for their extensive use in this and foreign countries by textile mills, laundries, hotels, hospitals, steam power plants, tanneries, ice manufacturing plants, bottling works, restaurants, beauty parlors, barber shops and residences.

Write our District Office nearest you for full information.

WM. B. SCAIFE & SONS CO.

Founded 1802

OAKMONT, PA.

PITTSBURGH OFFICE First Nat'l Bank Bldg.

NEW YORK OFFICE 26 Cortlandt Street

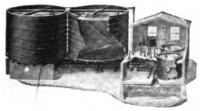
CHICAGO OFFICE First Nat'l Bank Bldg.

Water Purification for All Purposes: Continuous and Intermittent Water Softening and Purifying Systems; Pressure and Gravity Filters and Filtration Systems

SCAIFE WATER SOFTENING AND **PURIFYING SYSTEMS:**

The fundamental features of all our designs of systems are-accurate chemical treatment, thorough mixture of reagents with water, accelerated chemical reaction, rapid sedimentation, and perfect clarification. Design for each installation and performance guarantees are based upon scientific investigation of water supply and uses, supplemented by analysis and treatment of water in own laboratory.

We-Fu-Go System—(Intermittent): In this system definite quantities of water are treated, therefore accuracy of treatment can be maintained and uniform water obtained regardless of variations in quality of raw water or rate of use. Consists essentially of two or more re-



We-Fu-Go System (Patented)

action and settling tanks, which also act as storage tanks, fitted with mechanical stirring devices operated by power, a small reagent mixing tank, means for introducing the reagents into the reaction tanks, and a quartz filter of either gravity or pressure type. Built for any capacity.

Syphon System—(Continuous): automatic system not dependent upon moving mechanical devices for reagent introduction. The water enters a receiving tank to which is connected a syphon, into the long leg of which smaller syphons connect from the solution tanks. Reagents introduced during the period

of syphon discharge. This system can be arranged to be operated either from the ground or from the top.

In addition we manufacture three other standard continuous systems and design special SVStems where required.



Syphon System (Patented)

PRESSURE AND GRAVITY FILTER SYSTEMS:

Pressure Filters are adaptable for every purpose and are built in capacities from 20 gallons per hour upward, to withstand any required pressure. When operated in pairs, each filter is cleaned with filtered water, one filter furnishing the water for cleansing the other.



Pressure Filters

Gravity Filters are built in units with capacities varying from 8,000 to 1,000,000 gallons per 24 hours each. Combinations for practically any capacity with required sedimentation can be furnished.

Patented brass conical strainers and patented valveless coagulant feed apparatus are special features embodied in these filters and filter systems.



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H. S. B. W.-COCHRANE CORPORATION

Formerly Harrison Safety Boiler Works PHILADELPHIA, PA.

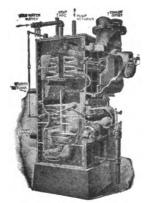
Atlanta
Baltimore
Birmingham
Boston
Charlotte
Chicago
Cincinnati
Cleveland

Dallas
Denver
Detroit
Houston
Indianapolis
Kansas City
Los Angeles
Minneapolis

New Orleans New York City Omaha Pittsburgh Portland Richmond St. Louis Salt Luke City San Antonio
San Francisco
Seattle
Syracuse
Tucson
Toronto
Montreal
Halifax

Calgary
Vancouver
Winnipeg
Paris
Calcutta
Havana
Shanghai

THE COCHRANE OPEN FEED-WATER HEATER:



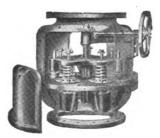
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The Cochrane Open Feed-Water Heater heats the boiler feed to 212° F. One per cent. of fuel is saved for each 11° F. rise in temperature.

The Cochrane Heater serves as a hot well or return tank and as an automatic cold water regulator. Extra water storage capacity can be provided as required.

Ask for our Book on "The Profitable Utilization of Exhaust Steam."

THE COCHRANE MULTIPORT BACK PRESSURE VALVE:



The Cochrane Multiport Back Pressure Valve differs from the ordinary back pressure valve in that a number of small disks are used instead of one large disk, thus reducing the size, weight and travel of the disks.

The back pressure is controlled easily by a hand-wheel, or from a distance by rods, chains, electric motor, etc.

All sizes, for vertical, angle and horizontal pipes.

Ask for "Multiports and Their Uses."
THE COCHRANE STEAM SEPARATOR:



The Cochrane Steam Separator stops slugs of water brought over from the boiler, or due to condensation in the steam line.

Cochrane Receiver Separators store steam close to the throttle, equalizing the flow through the steam line and raising the average pressure in the steam chest. It is thus possible to use smaller piping and fittings, reducing first cost and loss of heat by radiation. Cochrane Receiver Separators have proved very effective in eliminating vibration.

Our "Separator Book" will be sent upon request.

ENGINEERING

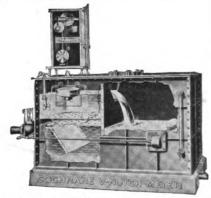
H. S. B. W.-COCHRANE CORPORATION

Formerly Harrison Safety Boiler Works

PHILADELPHIA, PA.

Manufacturers of the celebrated Cochrane Lines, including Open Feed Water Heaters, Steam Stack and Cut-out Valve Heaters and Receivers, Metering Heaters, and Independent Meters, Sorge-Cochrane Hot Process Water Softeners, Steam and Oil Separators, and Multiport Back Pressure, Atmospheric Relief, Flow and Check Valves

COCHRANE V-NOTCH METERS:

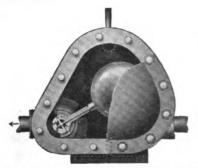


Cochrane V-Notch Meters are used for measuring the steam consumption of engines and turbines, returns from heating systems, boiler blow-off, etc.

The Cochrane Metering Heater heats water to 212° F. or higher and also meters it. The accuracy is guaranteed to be within 1½ per cent. of actual weight, variations in the temperature of the water not to exceed 25° F. above or below the specified temperature.

Ask for "Finding and Stopping Waste in Modern Boiler Rooms."

THE COCHRANE MULTIPORT DRAINER:



The Cochrane Multiport Drainer re-

moves condensate or drips from heating or drying coils, radiators, jackets, low-pressure steam and oil separators, etc. The hollow cylindrical valve is absolutely balanced, has large ports and has large capacity with low operating pressure. There are no stuffing boxes, packings, springs or links. Back pressures up to 30 lbs. per sq. in.

Ask for "Drainer Bulletin."

THE SORGE-COCHRANE HOT PRO-CESS WATER SOFTENER:



159

The Sorge-Cochrane Hot Process Water Softener heats the water to 210° F. before the chemical reagents are added.

The chemical reactions are much more rapid and complete than in cold water, and the precipitates settle more rapidly.

Complete protection to the boilers against corrosion and scale and the minimum amount of sludge-forming matter in the treated water are guaranteed.

Ask for the "Hot Process Softener."

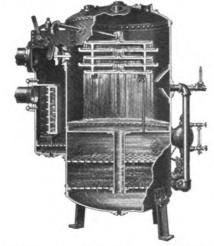
MILWAUKEE RELIANCE BOILER WORKS

MILWAUKEE, WISC.

Manufacturers of Feed Water Heaters, Gas Producers, Iron and Steel Tanks

"RELIANCE" FEED WATER HEATER, PURIFIER, FILTER AND RECEIVER:

Our heaters are built throughout in the most substantial and workmanlike manner. They have an extra large heating surface. They are very accessible for cleaning and parts replacement purposes, etc.



160

THE "RELIANCE" INDUCTION TYPE OPEN FEED WATER HEATER, PURIFIER, FILTER AND RECEIVER:

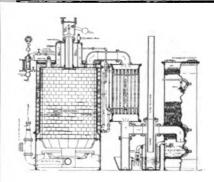
A heater containing all the better features of all other heaters without the faults and failures and incorporating improvements existent in none other. Special positive acting, non-clogging oil extractor.

Filter of the underfeed type assuring clean water, as by that method sediment cannot be disturbed by pump suction.

THE RELIANCE FEED WATER HEATER:

A Feed Water Heater, Purifier, Filter and Receiver that is different from the ordinary. Provided with an Oil Extractor that purifies.

Send for Catalogue.



SHARP BASSETT IMPROVED GAS PRODUCER:

A Gas Producer that combines simplicity of construction, convenience and ease of operation, economy and reliability under all operating conditions. Made in self-contained units of 25 to 300 H. P. combining in multiple unit plants in any size.

Constructed of the best materials and designed by experts. They show upon test the highest efficiency obtainable through any other power generating apparatus, and this at the lowest cost per unit of power delivered.

TANKS:

Steel Storage Air Receivers
Pneumatic Pressure, Tanks with Coils

Tanks for:

Packing House Chemical Works
Dye Plants Creameries

We are also equipped to manufacture special plate work of every description.

Send for Catalogues.

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PRATT AND CADY CO., INC.

HARTFORD, CONN.

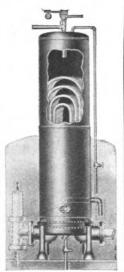
Manufacturers of Feed Water Heaters, Power Pumps, Converters, Hot Water Service Heaters, Distilling Condensers

Successor to I. B. Davis & Son, established 1872

Our Heaters are built with seamless drawn U-shaped brass tubes free to expand and contract without strain. Each end of every U-shaped tube is expanded into the annular grooves in the bore of the tube sheet by cold extrusion. They never leak.

THE DAVIS FEED WATER HEATER AND PURIFIER:

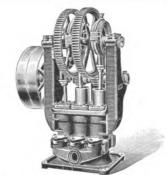
Uses exhaust steam to heat feed water. Delivers water to the boiler entirely free dirt and from scale-forming sediment. Saves coal and saves the boiler. Steam circulates through the brass tubes: water in shell. Regular type for pressure up to 100 lbs. Heavy type for pressures over 100 lbs., horizontal or vertical. Also made water tube type; water in tubes, steam in shell.



DAVIS DUPLEX, TRIPLEX AND GANG PUMPS:

Melter Pumps for special sugar house duty.

Regular construction for cold water. Belt or electrically driven. Brass fitted for hot water duty. Guided check or ball valves as required.



Gearing very powerful, takes strain near center of load. Teeth (machine cut) render pump practically noiseless in operation. Bearings large and of ample strength for severe service. All 161 boxes babbitted and adjustable. Cast iron cylinders, glands and plungers.

Composition valves. Many of these pumps installed over 30 years ago are still giving satisfactory service. Send for catalogs containing full information regarding capacities and sizes.

HOT WATER SERVICE HEATERS:

Built from regular patterns for every type of Hot Water Service. Uses live steam or exhaust, or both.



Built compact for constant and ample steam supply or with storage to suit requirements of intermittent Hot Water Service.

Gives perfect service in bakeries, hospitals, laundries, hotels, print and dye works and all places where hot water is required in quantities and at a moment's notice.

(See pages 208, 209 for additional products of this Company)

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THE NATIONAL PIPE BENDING CO.

MAIN OFFICE AND WORKS

NEW HAVEN, CONN.

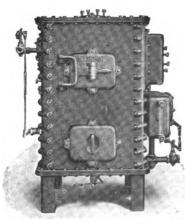
Manufacturers of the National Coil or Closed Feed Water Heater. The National Direct Contact Feed Water Heater and Purifier. National Storage Heaters. National Steam and Oil Separators. National Fuel-Oil Heaters. Coils and Bends of Iron, Brass and Copper Pipe

BOSTON, MASS., Ruggles & Klingemann, 10 High St.
PITTSBURGH, PA., H. W. Reisinger, 710 Park Bldg.
WASHINGTON, D. C., L. C. Holmes, 705 Ouray Bldg.
WASHINGTON, D. C., L. C. Holmes, 705 Ouray Bldg.
NEW YORK, N. Y., Franklin Williams, Inc., 39 Cortlandt St.
CLEVELAND, OHIO, Robert R. Harkins Pumping Machinery Co., 2179 East 18th St.
JACKSONVILLE, FLA., The Cameron & Barkley Co.
SALT LAKE CITY, UTAH, Hawley-Richardson-Williams Co., 611-612 Dooly Bldg.
CHICAGO, ILL., Arrow Engineering Co., Old Colony Bldg.
CHICAGO, ILL., Arrow Engineering Co., Old Colony Bldg.
ST. LOUIS, Mo., Machinery Arcade, 1011 Syndicate Trust Bldg.
ROCHESTER, N. Y., A. L. Covill, 1224 Granite Bldg.
CHARLOTTE, N. C., J. R. Purser, 406 Commercial Bank Bldg.

NATIONAL DIRECT CONTACT FEED WATER HEATER:

The feed water is brought to high temperature by direct and actual contact with the exhaust steam, then freed from those impurities which

Contact Pipe



National Direct Contact Feed Water Heater Patented April 18, 1913

are precipitated by heating, and, lastly, filtered before flowing to the pump. Combined in one apparatus are a Heater, a Purifier, a Storage Reservoir and an Oil Separator.

Water entering through regulating valve is distributed to the smaller or inner pipes which extend full length of heater. Overflowing the port at top, it passes as a thin film over entire outer surface of the large pipe. It is here warmed by steam in the steam pipe, which practically surrounds the water pipe. The exhaust steam, after passing through a National Oil Separator, which forms a part of the heater, escapes from steam pipe through the port at bottom, and in passing through the curtains of water heats it by actual contact to exhaust steam temperature.

water heats it by actual contact to exhaust steam temperature.

The heated water collects in the tray beneath the pipes and by means of a vertical pipe reaches the bottom of the heater, where the scale-forming substances are precipitated. The water then passes upward through the filter material to the hot storage chamber, from which the pure hot water flows direct to the pump.

NATIONAL OIL SEPARATOR:



Patented May 21, 1912

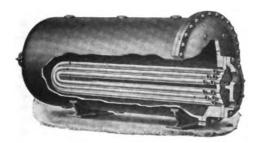
This gravity-type oil separator absolutely removes all grease or cylinder oil from exhaust steam so that the condensation may be used for feeding boilers, in laundry or dyehouse service, ice making, or for similar purposes. It has a multi-ported baffle plate, each port having an individual baffle, a distinctive feature found only in the National Separator. The large capacity of this separator not only insures effective separation of oil from exhaust steam but also overcomes the pulsations of exhaust giving an even omes the pulsations of exhaust, giving an even flow of steam.

COILS AND BENDS:

Coils and Bends of Iron, Steel, Brass and Copper Pipe and Tubing.



THE NATIONAL PIPE BENDING CO.



NATIONAL STORAGE HEATER:

This apparatus heats water either continuously or intermittently by live or exhaust steam, and stores it for either constant or occasional use.

It consists of a shell or tank containing a heating element, made up of bent pipe or tubing. Water from any source enters the bottom of the shell, is heated by steam in the heating element, and leaves at the top in quantities, and at intervals to meet the varied requirements.

The illustration shows the U-Bend type with cast iron shell, and heating element of bent copper tubes, with ends expanded into a steel tube-plate bolted on the outside of the head, and provided with a cast iron cover with suitable openings for the admission of steam and the removal of condensation.

The heating element is removable for inspection, repairs or substitution of a larger or smaller element when desired. It is placed in the lower part of the shell, where the entering water will come in contact with it, resulting in maximum efficiency in the transfer of heat. The area through the tubes is sufficient for unrestricted flow of steam and condensation.

Described in Bulletin No. 54.



NATIONAL COIL TYPE FEED WATER HEATER:

For use when the feed water need not be purified. In the National, the feed water is heated while being pumped through a coil of seamless-drawn copper tubing surrounded by exhaust steam. The water 163 is absolutely free from even a trace of oil, for it does not come in contact with the exhaust steam. The copper has no effect on the water.

The enclosing shell is of cast iron or steel plate: it lasts indefinitely because the feed water cannot reach it.

The economy resulting from the utilization of exhaust steam varies from 8 to 13% of the coal burned, depending on conditions-temperature of feed water and boiler pressure; but other advantages are reduction of strains caused by feeding cold water, and increase in boiler capacity.

The National is safe—the coils are tested to 600 pounds water pressure, and the shell is subjected to exhaust pressure only.

More then 3.250.000 horse power of these heaters have been installed.

Described in Bulletin No. 53.

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THE SIMS COMPANY

ERIE, PENNSYLVANIA

Manufacturer of Power Plant Appliances, Feed Water Heaters, Hot Water Generators, Tanks

"We Keep Others in Hot Water" SERVICE:

Do you have your water heating apparatus fitted to the needs of your plant? Have you had the benefit of a specialist's advice in the selection and installation of your equipment?

The Sims Company's Engineers are masters in keeping others in hot water and you are welcome to avail yourself of this accumulated experience when your problem is the heating or cooling of water and other liquids.

We do not merely sell you a piece of apparatus but furnish you service that has been a source of satisfaction to "Sims" users since 1886.

FEED WATER HEATERS:

The Sims Closed Feed Water Heater is built of the best obtainable materials. The sizes range from 30 to 10,000 H. P. 164 in the vertical or horizontal type.

This heater may be cleaned without breaking steam or water connections.

The Sims Open Feed Water Heater, filter and purifier is built with the same care and thought as the closed type. For the combined heating and purifying of feed water, this type of Sims Feed Water Heater has become standard equipment for a large part of the steamusing public. Its design and operation are simple. Its safety features provide against preventable accidents. Altogether, it is a machine designed for lasting, reliable service.

Sims Feed Water Heaters are in use in the power plants of well-known public service stations, municipal departments, industrial plants and institutional power houses.

HOT WATER GENERATORS:

We build two types of Hot Water Generators for supplying hot water in large quantities; an instantaneous generator and a circulating type. tubes in these heaters are arranged in such manner so that the water extracts the maximum heat. They operate on live or exhaust steam and provide an economical source for hot water in large quantities.

We specially recommend their use in hotels, hospitals, institutions, etc.

CONVERTORS:

For heating large or small buildings, hot water is rapidly coming to the fore. It is easy to control, both locally and as a unit; its temperature is comparatively low; it can be carried to greater distances than steam with less loss and its maintenance is more simple and less expensive. For hot water heating, our convertors will be found ideally suited.

STEAM TUBE STORAGE HEATERS:

For plants requiring hot water for some particular process of manufacturing. we build a line of simple and strong storage heaters-capacities from 100 to 20,000 gallons per hour at a temperature of 50 to 180 degrees F.

For use in hospitals, institutions, laundries, hotels, office buildings, etc.

"SIMCO" BOILERS AND WATER HEATERS:

The Simco heaters are water tube boilers, designed to operate either with gas, coal or oil fuel and to heat from 300 to 4000 gallons of water per hour. They are for such services as hot water supply, hot water heating and steam heating.

In connection with these heaters, we make another type of boiler, using refuse, garbage and the like for fuel.

GAS ENGINE ECONOMIZER:

For heating water or generating low pressure steam, we have designed a type of heater to utilize the waste heat, heretofore lost, in the exhaust of internal combustion engines. This heater is not affected by the exhaust gases.

SIMS STEAM SEPARATORS:

Our separators are of the type designed to extract the moisture by centrifugal motion. They deliver DRY steam to your engine. The materials and workmanship entering into the construction of these separators are the best. "Sims" experience and reputation guarantee them.

We also make in the standard Sims quality:

Muffler Separators Plain Tanks and Exhaust Heads Oil Filters Boiler Compound Feeders

Coil Tanks for Oil, Gas and Water

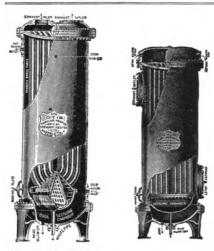
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THE STEWART HEATER CO.

NORTH TONAWANDA, N. Y.

Manufacturers of Feed Water Purifiers, Feed Water Heaters, Power Pumps, Etc.



OTIS HEATERS:

Closed Type
Steam Tube
Water Tube
Vertical
Horizontal
Live Steam
Combination
Live & Exhaust Steam
Storage

Our heaters have been noted for years for their efficiency and long life. Built with seamless copper tubes, steel shells and cast iron heads. The tubes are bent at the loose head, thus allowing for expansion. This heater has been particularly noted for its self-contained oil separator and purifier, eliminating all oil and moisture from the exhaust. This makes the exhaust steam available for further use after passing through the heater.

We recommend our steam tube exhaust heater as it is easily kept free from scale by washing out as all scale forms on the outside of the tubes and if not allowed to harden by frequent washing will maintain its efficiency indefinitely.

HEATER SPECIFICATIONS					
Size	Horse Power	Diameter Shell Inches	Total Height Inches	Size Water Connections Inches	Shipping Weight Pounds
No. K 4	50	15	48	11/4	650
No. KA 4	75	15	60	11/4	710
No. KB 4	100	15	72	11/4	780
No. KC 4	140	15	84	11/4	860
No. K 6 No. KA 6 No. KB 6	200 250 300	20 20 20	72 84 96	1½ 1½ 1½ 1½	1300 1420 1550
No. K 7	350	25	72	2 2	2100
No. KA 7	450	25	84		2280
No. K 8	550	25	96	2 2	2480
No. KA 8	650	25	108		2680
No. K 9	830	30	108	2½	3480
No. KA 9	975	30	120	2½	3760

HEATER SPECIFICATIONS

Size	Horse Power	Diameter Shell Inches	Total Height Inches	Size Water Connections Inches	Shipping Weight Pounds
No. K 10	1225	35	120	3	4970
No. KA 10	1400	35	132	3	5600
No. KB 10	1600	35	144	3	5280
No. K 12	1700	40	132	31/2	7870
No. KA 12	1950	40	144	31/2	8240
No. KB 12	2175	40	156	31/2	8600
No. K 14	2550	45	144	4	10270
No. KA 14	2850	45	156	4	10750
No. KB 14	3150	45	168	4	11230
No. K 18	3650	54	144	5	16300
No. KA 18	4150	54	156	5	17480
No. KB 18	4650	54	168	5	18240
No. KC 18	5150	54	180	5 5 5	19000
No. KD 18	5700	54	192	5	19780

Size numbers indicate largest size exhaust possible for steam tube heaters.

Water tube heaters can be finished with any size exhaust required.

STEWART PUMPS:

Boiler feed Belt driven Motor driven Triplex Light service

Stewart Pumps are equally well known for their economy.

Further information on request.

WARREN WEBSTER & COMPANY

Established 1888

MAIN OFFICE AND WORKS, CAMDEN, NEW JERSEY

BRANCH OFFICES IN THE FOLLOWING CITIES

NEW YORK PITTSBURGH Indianapolis LOS ANGELES AGINAW PHILADELPHIA ATLANTA CLEVELAND

NEW ORLEANS DENVER DETROIT MILWAUKEE CHICAGO St. Louis Minneapolis

WILKES-BARRE ROCHESTER BOSTON CINCINNATI KANSAS CITY SAN FRANCISCO WASHINGTON, D. C. ATLANTIC

CHARLOTTE BUFFALO DALLAS GRAND RAPIDS Tolerdo LOUISVILLE

OTTAWA

Winnipeg

Sole Representatives and Manufacturers for Canada
Sole Representatives and Manufacturers for Canada
DARLING BROTHERS LTD., MONTREAL
CALGARY TORONTO VANCOUVER MONTREAL HALIFAX
THE ATMOSPHERIC STEAM HEATING CO., LTD., LONDON, ENGLAND

SYSTEMS OF STEAM WEBSTER **HEATING:**

Vacuum Modulation

Hy-Lo

Having been pioneers in Vacuum Heating and before the engineering world for 30 years there are few in the line who do not know the reputation we have established for excellence of materials and service.

The devices which go to make up a Webster Vacuum or Modulation System are varied in construction and operation so as to meet all requirements, and standing back of each Webster Installation as we do, it is but natural that we 166 prefer to co-operate with the Architect, Consulting Engineer, Heating Contractor or Owner in the design and construction of the apparatus. The Webster Appliances are furnished as a complete We are at your service with a engineering organization, and trained have made fuel conservation a life-study.



Webster Sylphon Trap No. 522—Interior View

The Webster Sylphon Trap is by far the best water and air relief trap on the market, and by means of special Sylphon Attachments, the Sylphon principle can now be applied to almost any obsolete or less satisfactory valve. The

substitution of Sylphon for the old working parts takes but a few minutes and the old trap body is utilized without

disturbing the pipe connections.

The Webster Modulation Valve is made in several types also and can be applied to the supply connection of any kind of radiating surface using steam as a heating medium.

Universal joint-Extended stem valves for radiators beneath seats or behind grills, chain control for overhead radiators or coils have been perfected to a point of absolute success.



Webster Modulation Valve Type N—Interior View

The several types Webster of Modulation Valves are used successfully with or without a vacuum pump according to the nature of the building or buildings in which they are in-

stalled, and where applied and operated according to our instructions make it possible to modulate the temperature of a room by measuring the quantity of steam admitted.

The removal of air and water of condensation from radiators, coils or piping is accomplished successfully without steam leakage. The Webster Sylphon Trap, the most efficient device for that purpose, operates at any pressure or vacuum from 15 pounds above to 15 inches below atmospheric pressure, being compensated for pressure.

A perfect balance within this System can be maintained by the application of our Hy-Lo method with which a high vacuum can be carried on trunk lines and lower vacuums on branches, making lifts and difficult situations easy to overcome.

For Convenience, Economy and Efficiency in heating, there is no better method than "The Webster" and with our experienced Service Department Engineers, backed by our ability to make good, the slogan that "The Webster Guarantee is the Owner's Insurance Policy" is a fact and not a theory.

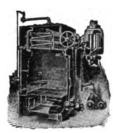
Write for illustrated bulletins containing complete information.

WARREN WEBSTER & COMPANY

WEBSTER FEED-WATER HEATERS:

All Webster Feed-water Heaters embody the following special features:

- (a) Heating Trays of perforated sheet metal, light, easy to clean, durable and permitting the most intimate intermixture of steam and water because of the small perforations obtainable by the use of such materials.
- (b) Open Sink Pans (instead of hollow floats)—for automatically controlling water inlets and overflow—positive in action, cannot become inoperative except by abuse.
- (c) Complete segregation of oil separator drips from any connection with other openings into the Heater, thus preventing all contamination otherwise caused by accident or negligence.
- (d) Vacuum Principle, by which the Heater assists the passage of steam into itself, thereby reducing back pressure upon engines.



Webster Feed-water Heater Class EB Cut-out Type Interior View

Webster Heaters save (1) Fuel (usually from 10 to 17%), (2) Water (usually from 10 to 14%) as compared with the use of a closed type of heater or with no heater whatever, (3) Boiler repairs due to boiler strains, and (4)

Boiler cleaning expense due to their action as Water Purifiers.

WEBSTER OPEN FEED-WATER HEATERS are built in all types and sizes for any conditions of service, space, head room, etc. They can be furnished either Standard Type (induction principle with Oil Separator attached to Heater shell) or Preference Type (the most improved form of Cut-out Heater using a Gate Valve in connection with an Oil Separator of ample size to purify all steam passing through the exhaust main to both the Feed-water Heater and to a Heating or Drying System or to Low Pressure Turbines).

Class "EB"—300 to 12000 horsepower capacities—vertical rectangular pattern upward flow filtration.

Class "EC"—500 to 7000 horsepower capacities—vertical rectangular pattern upward flow filtration.

Class "ED"—500 to 15000 horsepower capacities—horizontal cylindrical pattern (particularly adapted for low head-room)—upward flow filtration.

Class "EF"—50 to 350 horsepower capacities—vented rectangular one-piece body type—either upward or downward flow filtration as required.

Write for Bulletins 100-1 and 102.

WEBSTER STEAM AND OIL SEPARATORS:



Webster Steam Separators are made in plain and receiver types for horizontal, vertical or angle flow and for high or low pressure.

Write for Bulletin 301.

Webster Steam Separator

Webster Oil Separators are made in plain and receiver types, for horizontal, vertical or angle flow and for pressure, atmospheric or vacuum conditions. Condensation from strain passing through these separators



through these separators is Uebster Oil Separator separator view safe for boiler feed or manufacturing pur-

Write for Bulletin 401,

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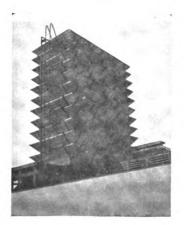
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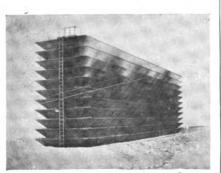
C. F. BRAUN & CO.

SAN FRANCISCO, U. S. A.

Manufacturing Mechanical Engineers





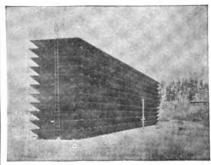


BRAUN COOLING TOWERS:

The Braun Cooling Tower is a substantial outdoor structure for cooling water by exposing it to the atmosphere, and consists of a structural frame, to which is secured a water distributing system on the top, a series of decks intercepting the falling water and exposing it to the air, and louvres, to permit of the free passage of air through the falling water, but to prevent the water being carried away by the air currents. It is without fans and the only power involved is that required for pumping the water, against a head of about 30 feet, to the top of the tower.

Their Field of Use includes supplying water for steam condensers, ammonia condensers in refrigerating plants, distillers in oil refineries, jackets of internal combustion engines and air compressors, electrical transformers, and for diverse purposes in industrial plants.

Results Obtainable are limited only by the wet bulb temperature which, in the United States, seldom exceeds 70° F. in any locality, even under the most unfavorable conditions, and averages more nearly 50° F. Without the use of prohibitively large towers final water temperatures can be obtained approaching the wet bulb within 5° to 10° F.



C. F. BRAUN & CO.

SAN FRANCISCO, U.S. A.

Manufacturing Mechanical Engineers

Many BRAUN towers installed in the hot interior valleys of California are consistently, during the hot summer months, delivering water at a temperature of 70° to 75°, although the temperature of the surrounding air is upwards of 100° F.

Strictly Scientific Principles are employed in the BRAUN cooling tower and its design. Construction and selection for varying conditions requires as much mechanical skill and practical experience as is required for the production of steam engines or ice machines. Cooling is accomplished both by direct heating of the air and by evaporation of a portion of the water, the problem being a complicated one, involving both temperature and vapor pressures.

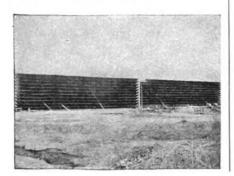
Loss of Water is, by the use of the large sloping louvres, reduced to an average of between two to three percent. These louvres act as separators, the entrained water being thrown against them by the air currents and drained back on to the decks.

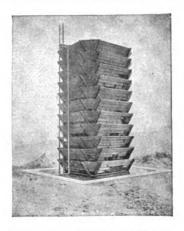
California Redwood is used exclusively and is the most resistant of all woods to decay. All bolts, tie rods, and similar fastenings are of brass.

Unit Panel Construction permits of rapid assembly in field with unskilled labor.

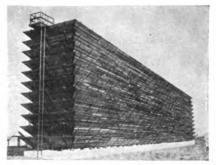
The Braun Mill in the heart of the redwood forest produces these towers on a manufacturing basis.

Large Stock of fabricated parts ready for immediate shipment includes sizes 10 to 10,000 G.P.M. capacity.









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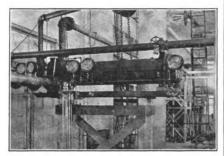
C. F. BRAUN & CO.

SAN FRANCISCO, U. S. A.

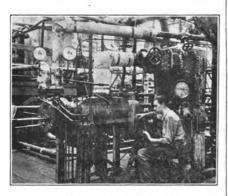
Manufacturing Mechanical Engineers

FLUID HEATERS, COOLERS AND HEAT EXCHANGERS FOR ALL INDUSTRIAL PURPOSES:

A Complete Standard Line of Heat Exchangers for Water, Oils, Juices and other fluids.



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Exchangers under Test

BRAUN HEAT EXCHANGERS include a very complete line of tubular apparatus for special industrial service such as heating oil with steam, cooling oil with water, heating or cooling sugar refinery juices, cooling distilled water with raw water, exchanging heat between oils, condensing vapor from oil refinery stills, and, in fact, to meet any conditions requiring the transferring of heat between fluids or vapors.

BRAUN TYPE "E" EXCHANGERS are employed only for transferring heat between a vapor and a fluid, the fluid flowing through the tubes in the correct number of passes to meet the required conditions, and the vapor filling the shell and surrounding the tubes.

BRAUN TYPE "ETL" EXCHANGERS

with longitudinal baffle and transverse turbulence plates are used for all conditions requiring the transfer of heat from a liquid to a liquid, one liquid being passed through the tubes and the other passing IN THE OPPOSITE DIRECTION along the outside of the tubes. The longitudinal baffle closely fitting slots in the shell directs the flow of the liquid on the outside of the tubes.



Braun Type "ETL" Heat Exchanger

C. F. BRAUN & CO.

SAN FRANCISCO, U.S. A.

Manufacturing Mechanical Engineers

Strictly Scientific principles are employed in the design of BRAUN heat exchangers, the problem being an exceedingly complicated one, involving the viscosity, density and specific heat and other characteristics of the fluid, as well as the quantity and temperature requirements and the frictional drop limitations.

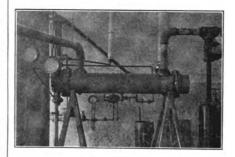
An exhaustive series of tests covering all of these factors enables the BRAUN engineers to select with certainty the apparatus required for any specified condition.

Efficiency Unequaled by any type of fluid to fluid heat exchanger is attained by the use of the transverse turbulence plates which produce convection currents with consequent high heat transfer rates.

Tubes Expanded into both tube sheets eliminate all possibility of leaks, and expansion differences are accommodated by the use of floating tube sheet.

Cleaning or Inspection of inside of tubes, or tube renewals, are readily accomplished by removing only light cover plates; cleaning of outside of tubes may be accomplished by removing the entire tube bundle. Most exchangers provide one of these features only.

Special performance guarantees given based upon the most complete research ever conducted on heat transfer with fluids of varying viscosities and other physical characteristics.





Exchangers under Test



Braun Type "E" Heat Exchanger (Continued on next pages)

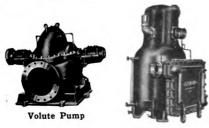
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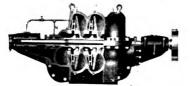
C. F. BRAUN & CO.

SAN FRANCISCO, U.S. A.

Manufacturing Mechanical Engineers



Evaporator



Turbine Pump

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By-Pass Valve

BRAUN BY-PASS VALVES are tee or cross body, three or four way, double seated globe type valves so arranged that a fluid entering one of the connections can, by raising or lowering the valve stem, be made to pass out through either of the other connections or to divide and pass through both. This is accomplished by the use of the two seats, the chamber between the seats communicating with one of the connections on the valve and the chamber on the outside of each seat communicating with one of the other connections. The bodies are much larger than those of standard valves, providing ample room for passages without restricted areas.

DESIGNED UNDER THE CLOSE PERSONAL DIRECTION OF AN ENGINEERING MANAGEMENT, CO-ORDINATING AND APPLYING SCIENTIFIC LABORATORY RESEARCH DATA AND FIELD TESTS AND EXPERIENCE.

BRAUN EVAPORATORS are designed primarily to produce from seawater a vapor suitable for distillation into drinking water or boiler feed make up, and being compact and accessible, are particularly adapted for marine service. They have also a wide range of uses in industrial establishments for concentrating juices, fractionating oils, or reducing other liquids, and for producing a potable and sterile water for employees.

BRAUN CENTRIFUGAL PUMPS include two complete lines, the single stage volute type and the multistage type, all embodying the most modern and highest grade features in pump design, fully bronze fitted with wearing parts bushed.

WRITE US SPECIFYING THE APPARATUS WHICH IS OF INTEREST TO YOU AND BULLETINS WILL BE FORWARDED PROMPTLY.

C. F. BRAUN & CO.

SAN FRANCISCO, U.S. A.

Manufacturing Mechanical Engineers

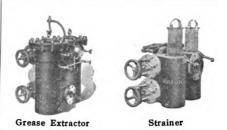
PRODUCED IN THE MOST COM-PLETE AND MODERN METAL WORKING PLANT IN THE WEST, INCLUDING MACHINE AND AS-SEMBLING SHOPS, IRON AND BRASS FOUNDRIES, AND PATTERN SHOP.

THE BRAUN GREASE EXTRAC-TOR is a compact boiler feed water filter in which the filtering surface is linen terry cloth (turkish toweling) and embodies duplicate filters and valves by means of which either compartment may be by-passed for cleaning while the other is in service.

THE BRAUN TWIN STRAINER is a very compact apparatus, embodying duplicate strainers and valves by means of which either compartment may be bypassed for cleaning while the other is in service.

BRAUN CONDENSING APPARATUS includes a complete line of surface condensers, air pumps, and circulating pumps.

BRAUN ANCHORS AND GUIDES are offered as accessories of BRAUN expansion joints, and provide a reliable method of limiting and controlling the pipe movement toward each expansion joint.





Condenser

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Expansion Joint

BRAUN EXPANSION JOINTS are offered to fill the growing demand for a reliable slip joint of correct mechanical design, best obtainable materials, and exact and careful workmanship. Bored guides, in which the finished flange slides support the weight of the cylinder flanges and adjacent pipe, and insure accurate alignment of moving cylinders with the joint body. The ordinary joint construction permits the packing to carry the weight of these parts.

CROLL-REYNOLDS CO., INC.

95 LIBERTY ST., NEW YORK

Manufacturers of the Evactor Steam Jet Air Pump



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THE EVACTOR:

When operative difficulties lose your vacuum and your reciprocating or hydraulic vacuum pump must be cut off the line, remember that the Evactor performs the same service without those exasperating troubles. It has proven reliable and efficient in maintaining continuous vacuum in connection with Surface, Jet and Barometric Condensers, Evaporators, Stills, etc.

Construction:

The Evactor consists of one primary stage steam ejector connected to condenser, an intercooler of the jet or surface type and two secondary stage steam ejectors in parallel, which discharge against back pressure up to 2 pounds gage. Special design Evactors discharge against higher back pressures with a corresponding increase in amount of steam required.

The steam nozzles are made of Monel Metal and exhaust nozzles of bronze, thus reducing erosion to a minimum. For special chemical uses the Evactor can be made entirely of some other specified alloy or material.

Advantages:

- Has no moving parts
- Requires no lubrication
- 3. Attendance and upkeep practically negligible
- Efficiency remains practically constant with continuous use
- Operation simple and immediate
- 6. No air cylinder to be wrecked by water
- Small space—no foundation
- Minimum installation cost 9.
- Economical steam consumption
- 10. In chemical processes there are no parts to corrode

Capacities:

The Evactor differs from other steam jet types of air pumps in having three separate and distinct capacities due to special arrangement of first and second stage ejectors.

The first capacity is for a condition where leakage is less than estimated normal; the second is for normal air leakage; and the third is for air leakage greater than estimated normal.

Service:

We shall be pleased to afford you the benefit of our extensive experience in this field and aid you in the selection of the proper equipment for the service.

Send for our catalog "B."

MANISTEE IRON WORKS COMPANY

MANISTEE, MICHIGAN

Manufacturers of Roturbo Rotary Jet Condensers and Air Pumps

THE ROTURBO ROTARY JET CON-DENSERS AND AIR PUMPS, although slightly different in minor detail and size, both embody the Patent Pressure Chamber Impeller used in the Roturbo Centrifugal Pumps. This, combined with ingenious design results in a mechanism which is distinctive on account of its simplicity,



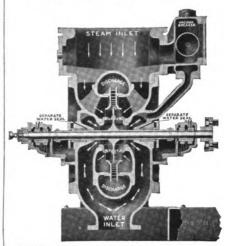
Impeller The Only Moving Part

having only one moving part. It is noted for its efficiency in maintaining high and variable vacuums.

The single rotating portion of the apparatus performs three functions: Firstly, the impeller

lifts the circulating water through any height up to 25 or 26 feet, and imparts to it a hydraulic head thus performing the function of the circulating pump.

Secondly, the space between the periphery of the impeller and the inner circumference of the fan wheel forms the mixing chamber and vacuum space in which the vapor is brought in contact with the radial jets of water.



Sectional Drawing of Condenser or Air Pump

Thirdly, the fan wheel itself acts as ejector and extracts the mixture of circulating water, condensate and non-condensable vapors against the external atmospheric pressure thus performing functions of air pump.

RITURES MANISTEE IRON WORKS CO. RITURES

Condenser Driven through Gears

The Condenser and Air Pump are built for all capacities of steam or air and are especially adapted for high vacuums. They may be arranged for direct connection or through gears or belt and pulley to any type of driver.

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WESTINGHOUSE ELECTRIC & MFG. CO.

EAST PITTSBURGH, PA.

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Bluefield, W. Va.
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.
Chattanooga, Tenn.
Chicago, Ill.
Cincinnati, Ohio

Cleveland, Ohio
Columbus, Ohio
*Dallas, Texas
Dayton, Ohio
Denver, Colo.
Des Moines, Ia.
Detroit, Mich.
Duluth, Minn.
*El Paso, Texas
Houston, Texas
Houston, Texas
Indianapolis, Ind.
Joplin, Mo.

Kansas City, Mo. Louisville, Ky. Los Angeles, Cal. Memphis, Tenn. Milwaukee, Wis. Minneapolis, Minn. New Orleans, La. New York, N. Y. Philadelphia, Pa. Pittsburgh, Pa. Portland, Ore. Rochester, N. Y.

St. Louis, Mo.
Salt Lake City, Utah
San Francisco, Cal.
Seattle, Wash.
Syracuse, N. Y.
Toledo, Ohio
Tucson, Ariz.
Washington, D. C.
Wilkes-Barre, Pa.
*W. E. & M. Co.
of Texas

ELECTRICAL EQUIPMENT:



Generating Equipment
Switchboards
Switchboard Meters
Converters
Heating Devices
Lightning Arresters
Motors (Alternating Current)
Motors (Direct Current)
Arc Lamps
Control Equipment

Transformers
Regulators
Co-operative Service:

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Westinghouse Electric & Manufacturing Company, manufacturers of apparatus for Generation, Application and Control of electric power, invite the members of the A. S. M. E. to use the facilities of our engineering department in the planning and selecting of electrical equipment.

Westinghouse Type SK direct-current motors are designed for general constant and adjustable speed service, and, therefore, find extensive application to machines used in practically every industry, especially for driving machine tools and

for other services where the load is frequently started, stopped, or reversed. The SK motors are of steel construction, with few parts, all of

which are readily accessible. The materials used have been selected so as to combine light weight with great mechanical strength.

Westinghouse Type CS alternatingcurrent motors are designed for general

constant speed service and are, therefore, applicable for driving machines in every industry. They are made



in all standard sizes from 2 to 650 horsepower, for all commercial voltages and frequencies.

Forged open-hearth steel is largely used in the construction, which not only provides great strength but reduces the weight of the inactive material and all overall dimensions to a minimum. The rotors are practically indestructible; the bearings have very liberal areas, are non-leaking and are protected from dust.

The efficiency, power factor, and overload capacity are unusually high, since high efficiency means low operating costs. Special attention has been given to this point, not only at full loads, but at fractional loads. As a result of these features, type CS motors can be depended on to operate with maximum

economy and to give satisfactory service for years, with little attention.

SEE OURADYTE IN MECHANICAL ENGINEERING INC. MINISTER A SMS

WESTINGHOUSE ELECTRIC & MFG. CO.

POWER EQUIPMENT:



Steam Turbine-Generators from one to 100,000 Horse Power

Condensers-Surface, Low-Level Jet and Barometric

Stokers-Underfeed, Roney and Chain Grate

Power House Auxiliaries, such as small geared Steam Turbine-Generators and geared turbines for Pump, Fan and Blower drive



of Because exceptional performance, Westinghouse Condensers have become generally known throughout this country and abroad as HIGH-VACUA Condensers.

Large Surface Condensers

They are installed and operating in many parts of the world—Peru, Russia, Brazil, Porto Rico, Manchuria, Cuba, New Foundland, Japan, Hawaii, New Mexico, British West Indies, Alaska, Siberia and other lands. Only Condensers of UNDISPUTED RELIABILITY could have become so widely known and used.

At the present time Westinghouse Surface Condensers are being built to serve turbines up to 100,000 Horse Power.

COMPACTNESS is a very important feature of all Westinghouse Condensers. This is especially true of the Jet Type referred to later, and of the Unit Type



Unit Type Surface Condenser

Surface. All pumps are located directly beneath and the pump runners are mounted on one shaft, driven by one turbine or motor as demanded by local conditions.

Jet Condensers are also built in large sizes—the largest to date being a type to serve a 45,000 kw. turbine. The twin type is often made use of when large capacity is required, not because the limit in size of the single condenser is reached, but because the twin type fre-



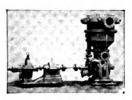
quently can be better adapted to the require-ments of the installation. It has the additional advantage of greater surety of uninterrupted operation, for should it become necessary the full load of the turbine may

Twin Type Jet Condenser

be carried on one "leg" with good

vacua until the necessary inspection of the other half is completed. This is a feature which should not be overlooked by the prospective condenser purchaser.

The Westinghouse Leblanc Air Pump, 177 used on all our Condensers, has become well known throughout the country on account of its very high efficiency. Being of the centrifugal type and removing the air by "water pistons" or water layers, it has the peculiar advantage of increasing in efficiency at the time highest efficiency



Small Low Level Jet Condenser

is most needed-as the VACUUM IN-CREASES. Hence the efficiency of the Leblanc Pump rises until maximum air scavenging is attained. The absence of reciprocating parts, valves and clearances, enables it to far exceed the reciprocating pump in efficiency and continuity of service.

Westinghouse Condensers are unexcelled in the ability to maintain high vacua, simplicity of construction, reliability and compactness.

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WHEELER CONDENSER AND ENGINEERING CO.

Manufacturers of Complete Condensing and Evaporating Equipment Including Seamless Drawn Tubes

GENERAL OFFICES AND WORKS:

CARTERET, NEW JERSEY

BRANCHES: New York, Boston, Philadelphia, Chicago, Cincinnati, Pittsburgh, San Francisco, New Orleans, Atlanta, Salt Lake City, Seattle, Los Angeles, London, Yokohama, Melbourne, Shanghai, Havana

HIGH VACUUM SURFACE CONDENSERS:



Wheeler High Vacuum Surface Condenser For turbines of any capacity. Tube arrangement gives best distribution of steam for high efficiency and maximum rate of heat transmission.



HIGH VACUUM JET CONDENSERS:

For turbines of any size to maintain vacuum of 28 and 29 inches. Built on the countercurrent "rain type" principle.

WHEELER STEAM JET AIR PUMP:



178

Wheeler Steam Jet Air Pump, Patented

This patented pump covers the valuable feature of two or more steam jets working in series with a condenser between the jets. Most efficient Steam Jet Air Pump made.

WHEELER-ED-WARDSAIR PUMPS FOR AIR AND CONDEN-SATE:

Eliminate expense of independent air and hot well pumps. No suction or bucket valves.

WHEELER ROTATIVE DRY VAC-UUM PUMP:

Maintains a vacuum within 0.5" of barometer. For high vacuum jet condensers and large surface condensing equipments. Clearance effect reduced by an equalizing port.

WHEELER TURBO AIR PUMPS:

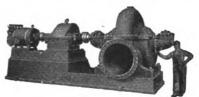
High Speed Rotary Type for jet or surface condensers. Direct connected to turbine or motor.

CENTRIF-UGAL PUMPS FOR ALL SERVICES:

Circulating, tail water, and hot well pumps for condensers. High efficiency



Wheeler Turbo Air Pump



Wheeler Geared Turbine Centrifugal Pump

single stage pumps for all purposes. Pumps of all sizes driven by motor, steam turbine or engine for water works, irrigation, etc.

CRESCENT BRAND SEAMLESS DRAWN TUBES:

All standard sizes and gauges manufactured in large Wheeler mill particularly for condensers, evaporators, heaters, reboilers, etc. Copper, Brass, Special Mixture.

EVAPORATORS:

Lillie vapor and liquor reversing, or standard types. Multiple or single effect.

COOLING TOWERS:

For manuing and industrial plants, also central stations where a supply of cooling water is not available. All types: natural draft, and combined.

Put your cooling problems up to our engineers.



Wheeler-Barnard Forced Draft Cooling Tower

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C. H. WHEELER MANUFACTURING COMPANY

MAIN OFFICE AND WORKS:

SEDGLEY AND LEHIGH AVENUES, PHILADELPHIA, PA.

BRANCH OFFICES:

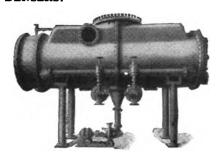
NEW YORK SAN FRANCISCO Boston

CHICAGO NEW ORLEANS PITTSBURGH CHARLOTTE

Manufacturers of Surface Condensers, Jet Condensers, Vacuum Pumps, Centrifugal Pumps, Engines, Cooling Towers, Etc.

C. H. WHEELER HIGH EFFI-CIENCY SYSTEM of Steam Condensers and Auxiliaries, in which we specialize, consists of:

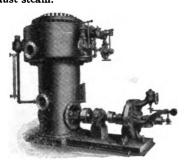
HIGH VACUUM SURFACE CONDENSERS:



C. H. Wheeler Condenser with Two Radojets and Motor Driven Hot Well Pump

HIGH VACUUM JET CONDENSERS:

Specially designed, insuring complete and intimate mixture of water and exhaust steam.



Jet Condenser

EXHAUST FITTINGS:

Atmospheric exhaust back outlet Gate Valves.

MULTIFLEX atmospheric exhaust relief valve.

Expansion Joints.

VACUUM PUMPS:

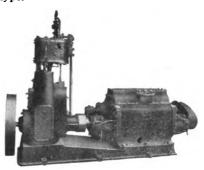
RADOJET, ejector type.



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Radojet Vacuum Pump

ROTREX, suction valveless rotary type.



Engine Driven Rotrex Pump

MULLAN, crank and fly wheel type. WATER COOLING TOWERS:

WAIER COOLING TOWERS:

Forced and natural draft types.

CENTRIFUGAL PUMPS:

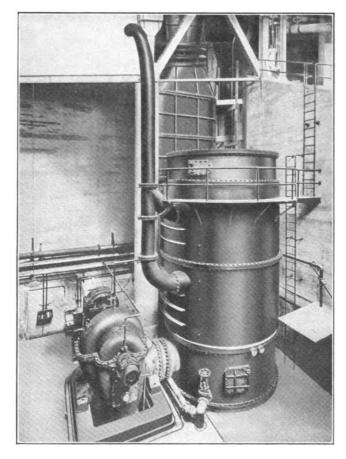
For low and medium pumping heads.

WORTHINGTON PUMP AND MACHINERY CORPORATION

115 BROADWAY, NEW YORK

WORKS: HARRISON, N. J.

Manufacturers of Surface, Barometric and Centrifugal Jet Condensing Systems, Complete with Auxiliaries; Duplex Direct-Acting, Centrifugal, Turbine and Multi-Stage Pumps for Every Service, Boiler Feed, Elevator, Fire, Pressure Pumps; Water Meters; Water Works, Sewage and Drainage Pumping Engines



30,000 Sq. Ft. Vertical Surface

WORTHINGTON SURFACE CONDENSERS:

Condenser equipment installed for the Louisville Gas & Electric Co., Louisville, Cincinnati, Ohio.

Ky. This equipment is similar to those installed for the Union Gas & Electric Co., Cincinnati, Ohio.



(See page 50 for additional products of this Company.)

E. B. BADGER & SONS COMPANY

BOSTON, MASS., U. S. A.

NEW YORK OFFICE, 101 PARK AVENUE

CHICAGO OFFICE, 616 So. MICHIGAN AVENUE

PRODUCTS:

Water Cooling Systems; Air Washers; Air Conditioning Apparatus; Air Coolers; Smoke Washers; Odor Condensers; Gas Scrubbers; Humidifiers; Spray, Sewage and Aerating Nozzle; Spray equipment for acid plants.

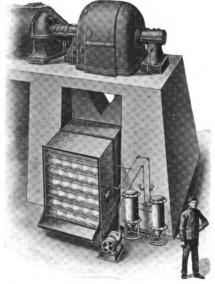
USES FOR SPRAYING EQUIPMENT:

Cooling water for condensers, stills, etc., to afford 28" vacuum or better. Cooling liquids and spraying brine for refrigerating plants.

Cooling, spraying and washing oils.
Spray system for sulphuric acid plants.
Evaporating or densifying liquids by
spraying at moderate temperature,
resulting in fuel economy.

Spray plants for atomizing purposes. Spray washers for scrubbing gases. Dust precipitation and collection. Aerating and purifying water supplies. Condensing and absorbing odors and

Washing and humidifying air.
Cleaning blast furnace gases.
Reclaiming gasoline, etc.
Removing suds from paper machines.
Spraying (humidifying) cements and fire clays.



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AIR WASHERS:

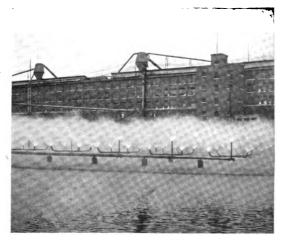
The washers are adapted to cooling, cleansing and humidifying air in chemical works, textile mills, factories, in fact wherever cool, clean air of even tempera-

Badger Air Washer

ture and humidity is required for successful operation of processes. These cool air to its wet bulb temperature, removing 98% of the suspended dust. Being compact in design they require little space.

WATER COOLING SYSTEMS:

These systems are adapted to cooling condensing water from stills, evaporators, etc., for re-use and are especially useful where water is scarce. When cooling water for steam power plants they are guaranteed to cool the water sufficiently to afford an average vacuum better than 28" based on modern condensing equipment and good operating conditions. Systems can be operated at 6 lbs. pressure or less which will cool to, or below atmospheric temperature.



A Badger Cooling Pond

(See page 251 for additional products of this Company)

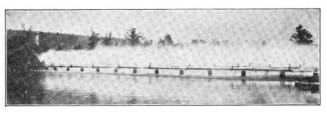
SPRAY ENGINEERING CO.

93 Federal St., BOSTON, MASS.

Engineers for Spray Cooling Systems, Air Conditioning, Gas Washing,
Aerating Reservoirs, Irrigation Systems

SPRACO COOLING SYSTEMS:

The SPRACO Cooling System is the simplest, most economical, and efficient device in existence for cooling water used in condensers, water jackets, transformers,



evaporators, and other equipment where the conservation of the water supply is essential.

Under ordinary conditions, the power required averages less than $1\frac{1}{2}\%$ of the total power generated by the prime movers in the plant. A cooling tower of equal capacity would require for its operation about 3% of the total power generated.

As SPRACO Cooling Systems have a lower initial cost, require less power for operation, and practically no maintenance as compared with well designed and constructed cooling towers, they are being used universally in connection with power plants, sugar centrals, etc.

We find from our experience in designing over eight hundred ponds, now in successful operation in the United States and other countries, that it is impossible to lay down exact rules for the design of these ponds, as local conditions make each case a special problem. Hence, if the amount of water to be cooled, the amount of steam condensed in heating this water, the cooling or vacuum desired, as well as the dimensions of the space available for the installation and whether on ground or roof are given us, we will be pleased to send complete specifications and sketch of arrangement best suited to conditions given.

The Spray Engineering Company accepts full responsibility for the design and construction of every SPRACO System (including the pond or concrete basin where desired), and guarantees the cooling in every case.

SPRACO AIR WASHERS:

As the capacity of an electric generator is directly dependent upon its temperature, which in turn depends upon the air conditions, an ample supply of cool, clean

air is of great importance. Unless a generator is kept clean, by supplying it with washed air, its load-carrying capacity will be decreased. Dust or soot deposited within the machine greatly reduces the efficiency of air as

a cooling medium. Unwashed air, therefore, means excessive heating, which not only reduces the electrical efficiency, but shortens the life of insulation so that grounds and even burn-outs are liable to occur.

SPRACO Air Washing and Cooling Equipments are especially designed for conditioning the ventilating air for electrical machines, and give maximum efficiency as regards both cleansing and cooling. Generators equipped with SPRACO washers are free from the above-mentioned troubles. The result-



ing gain in efficiency and capacity, the saving in maintenance, and longer life of

the machines to which they are attached, make the installation of SPRACO washers inevitable in all progressive and up-to-date power plants.



SPRAY ENGINEERING CO.

93 FEDERAL ST., BOSTON, MASS.

Manufacturers of Air Washing Equipment, Spray Cooling Equipment, Flow Meters, Paint Spraying Equipment, Cement Spraying Equipment, Park Sprinklers, Nozzles for all Purposes

SPRACO PNEUMATIC PAINTING EOUIPMENTS:

The modern method of applying paints and other protective coatings is by the use of compressed air. This is rapidly superseding the old hand-brushing method not only by reason of the great saving



time labor, but also due to the fact that better results are ob-tained. To meet the increasing demand for an efficient, rugged device, suitable for a wide range of work, the Spray Engineer-Company ing developed the improved SPRACO Pneumatic Painting

E q u i p m e n t s. They are compact, portable, and well adapted for both field and shop use. Each outfit is complete in itself, ready for attachment by hose connection to your compressed air supply. Where compressed air is not available, we are prepared to furnish gasoline engine or motor-driven air compressor units.

Some of the Advantages: One workman can do the work of three to twelve painters using brushes, depending upon the nature of the work. Uniformly finished coatings, free from streaks and brush marks, are produced. Rough, irregular, and inaccessible surfaces are readily coated. Either a lighter or heavier coating can be obtained than is possible with hand-brushes. Standard guns are capable of handling all classes of liquid coatings by using interchange able caps and nose pieces. The gun and control head may be blown free from paint or cleaned without taking apart. The gun may be mounted on an extension pole for painting surfaces beyond the reach of the operator.

VAUGHAN FLOW METER:

Vaughan The Meter, as illustrated, is an instrument designed to meet the demand for a simple and efficient method of accurately indicating the flow of liquids in pipes under pressure. It is especially applica-ble for indicating the flow of water to electric transformers, boiler sup-ply, bearing lubrication for turbines, oil for furnaces, as well as miscellaneous commercial purposes where the ca-pacity of the liquid does not exceed 100 G. P. M.



SPRACO CENTER JET NOZZLES
The patented SPRACO nozzles are simple in design, yet produce a spray entirely different from that of any other

type of nozzle. A part of the liquid is given a rapid rotating motion by the turbine center, and is driven forth through the orifice by the central driving jet, producing a spray of solid conical formation of equal density across its section. This feature makes it the most efficient nozzle on the

market, and especially advantageous in cases where it is desired to bring a finely divided liquid into intimate contact with air or other gases. SPRACO nozzles are used for:

Aerating Water Supplies Atomizing Liquids

Brine Spraying for Refrigeration Purposes

Evaporating Liquids Humidifying Air Reclaiming Gasoline Scrubbing Gases Special Chemical Purposes Spraying Bituminous Materials in Road

Construction, etc.

SERVICE:

Our customers are at liberty to refer their problems to our Engineering Department for advice as to proper installation, operation, etc.

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CRANE CO.

Founded by R. T. Crane 1855

836 So. Michigan Ave., CHICAGO, ILL.

SALES OFFICES, WAREHOUSES AND SHOWROOMS:

BOSTON
SPRINGFIELD
BRIDGEPORT
ROCHESTER
NEW YORK
ALBANY
BROOKLYN
PHILADELPHIA
READING
NEWARK

CAMDEN BALTIMORE WASHINGTON SYRACUSE BUFFALO SAVANNAH ATLANTA KNOXVILLE BIRMINGHAM MEMPHIS LITTLE ROCK
MUSEOGEE
TULSA
OKLAHOMA CITY
WICHITA
ST. LOUIS
KANSAS CITY
TERRE HAUTE
CINCINNATI
INDIANAPOLIS

DETROIT
CHICAGO
ROCKFORD
OSHKOSH
GRAND RAPIDS
DAVENPORT
DES MOINES
OMAHA
SIOUX CITY
ST. PAUL

WINONA
MINNEAPOLIS
DULUTH
FARGO
WATERTOWN
ABBERDEEN
GREAT FALLS
BILLINGS
SPOKANE
SEATTLE

TACOMA
PORTLAND
POCATELLO
SALT LAKE CITY
OGDEN
SACRAMENTO
OAKLAND
SAN FRANCISCO
LOS ANGELES

WORKS: CHICAGO AND BRIDGEPORT

CRANE

Montreal, Toronto, Vancouver, Winnipeg, London, Eng., Sydney, N. S. W., Quebec, Halifax, Ottawa, Calgary

We Manufacture

a Complete Line of

VALVES, COCKS AND FITTINGS

in

184

Brass

Iron

Ferrosteel

Cast Steel

for all pressures and purposes.

Malleable and Cast Iron
Screwed Fittings,

Drainage Fittings

HYDRAULIC VALVES AND FITTINGS:

Twenty thousand articles for use in handling steam, water, gas, air, oil, etc.

FLANGED FITTINGS

of every description.

Pipe Fitters' Tools and Engineers' Supplies

STEAM SPECIALTIES:

Automatic Stop-Check Valves, Emergency, Exhaust Relief and Back Pressure Valves, Steam and Oil Separators, Steam Traps, Pop Safety and Relief Valves.

Cast Steel Valves and Cast Steel Fittings especially constructed for Superheated Steam.

Estimates furnished from drawings submitted, on Complete Piping Equipment, Pipe Bends, etc.

CRANE CO.

CRANE VALVES
that comply with the
A. S. M. E. BOILER CODE:

O. S. & Y. Pop Safety Valves will fulfill all the Safety Valve requirements of stationary and marine boiler rules. Made with brass or monel metal seats. Set to any pressure up to 250 pounds.



No. 1117 Flanged, No. 1116 Screwed Pop Safety Valve Iron or Steel 1½" to 4½"

No. 68E Brass Water Column Gate Valve 34" to 2"

O. S. & Y. Extra Heavy Gate Valves for steam working pressure up to 250 pounds and a total temperature of 500° F. Water working pressure up to 350 pounds. Tested to 800 pounds hydraulic pressure per square inch.

All steam plants having more than one boiler should have one of these combination stop check valves in the piping between each boiler and the main steam line or header. Made with renewable seat.



No. 30E Automatic Stop Check Valve Iron or Steel 2½" to 10"



No. 92E Brass Boiler Feed Check 1/4" to 3"

Extra Heavy Regrinding Union Bonnet Horizontal Check Valve, made of Crane Special Brass. We recommend these valves for use as blowoffs on small high pressure boilers and all other purposes where it is desirable to blow off dirty water, or water containing grit or sediment under pressure.



No. 391 Flange Blow-Off Valve Iron or Steel 1½" to 2½"



Extra Heavy O. S. & Y. Gate Valves 6 inch and larger should have a by-pass. We do not recommend the use of screwed valves larger than 6 inch. The outside screw indicates whether the valve is open, partly open or closed.

No. 9E Gate Valve Iron or Steel All Sizes

Extra Heavy All Iron Blow-off Cocks are made with compensating spring, which is located between the plug and the cap and automatically takes up wear and holds the plug securely in place at all times.



185

No. 317 All Iron Blow-Off Cock I" to 2½"



No. 87E Brass Boiler Feed Stop 1 ½" to 3" Extra Heavy Globe and Angle Valves, made with renewable seat and bolted yoke.



BOILERS EQUIPPED WITH THESE VALVES REPRESENT THE BEST ENGINEERING PRACTICE.

(Continued on next pages)

(Continued from preceding pages)

CRANE CO.

CHICAGO, ILL.

CRANE CAST STEEL VALVES AND FITTINGS:

We have been manufacturing for some time steel valves and fittings to meet a steadily growing demand for a superior grade of goods, especially adapted for High Pressure, Saturated and Superheated Steam Lines and Extreme Hydraulic Service. One line is suitable for 250 pounds pressure and 700 degrees F. and a special line is suitable for 400 pounds



186

No. 9A Rising Stem Gate Valve with By-Pass



No. 23A Angle Valve

GENERAL SPECIFICATIONS FOR STEEL VALVES:

CAST STEEL Body, Bonnet, Disc and Yoke MONEL METAL Seats

ROLLED MONEL METAL or STEEL Stems

pressure and 800 degrees F. We are prepared to supply Pop Safety, Gate, Blow-Off Valves, and all other material to comply with the A. S. M. E. Boiler Code.



No. 101D Elbow



No. 105D Tee Extra Heavy Cast Steel Flanged Fittings

NON-RETURN TRAP

Made in sizes 1/4 to 3 inch; capacities up to 50,000 pounds of water an hour.



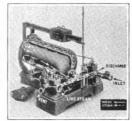
DIRECT RETURN TRAP

Made in sizes 1/2 to 4 inch; capacities up to 28,000 pounds of water an hour.



LIFTING AND VACUUM TRAP

Made in sizes 1/2 to 4 inch; capacities up to 28,000 pounds of water an hour





For condensing or non-condensing engines.

CRANE CO.





ER

ELECTRICALLY OPERATED VALVE

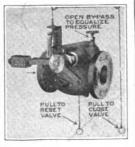
CRANE FORGED STEEL VALVES AND FITTINGS:

Are suitable for pressures up to 10,000 lbs., depending on the article and size.



EMERGENCY ENGINE STOP VALVE:

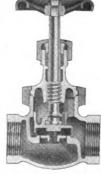
The frequency of accidents which require the shutting off of steam instantly has led several states to require by law a quick-closing Engine



Stop Valve on the steam lead to each engine.

BRASS GLOBE AND ANGLE VALVES:

Made with union bonnets and Jenkins disc for steam pressures up to 150 pounds. Designed to be used in plants where continuous service is required and where discs must be changed quickly without injury to the valve.



No. 7 Brass Globe Valve

STEAM SEPARATORS:

These are made standard and extra heavy in vertical, horizontal and received types. They have large areas and ample baffle surfaces, affording the highest degree; of efficiency with the slightest loss in pressure.



No. 013 Extra Heavy Vertical Separator

BRASS RELIEF VALVES:

These relief valves are recommended for service on Compressor and steam cylinder where instantaneous relief is wanted from excess pressures. Set at any pressure specified from 5 to 250 pounds,



No. 1134 rass Relief Valve

DARLING VALVE & MFG. CO.

WILLIAMSPORT, PA.

Manufacturers of Gate Valves for Water, Steam, Gas, Oil, Acid, Etc., Ball Check Valves, Fire Hydrants, Indicator Posts, Floor Stands and Valve Boxes

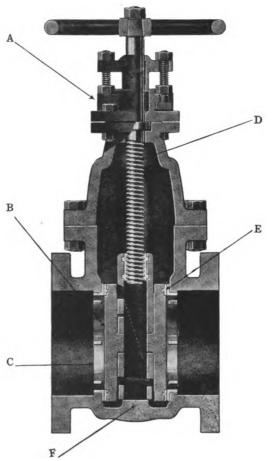
THE DARLING PATENTED GATE VALVE differs from all others now manufactured in that it has compound equalizing Wedges, Parallel Seats and Double Revolving Gate Discs thus em-bodying three distinct advantages, which result in the valves operating easier, wearing longer and giving better service than any other make.

against their Seats. In opening the Valve the first turn of the Stem withdraws the Upper Wedge from contact with the Lower Wedge, instantly releasing both Discs from their Seats before they start to rise.

F, Boss in bottom of case that stops downward travel of Lower Wedge.

- A, Improved Stuffing Box. Stuffing Box Bolts are independent of the Gland Bolts which permits the removal of the Stuffing Box without disturbing the Gland or Pack-
- B, the Discs being independent of each other and independent of the Wedges 188 are free to revolve and change their positions on the seats each time the Valve is closed, avoiding unequal wear.
 - C, Seats are renewable. They are made with lugs by B which they are screwed into the body and by which they may be removed.
 - D, the Stem works through the threaded hole in the upper Wedge and has a perfectly clear, straight passage down through the Wedge with no irregular shapes to encounter to cause it to bind, bend or break.
 - E, the Ground Faces of the Discs and Seats are entirely free from injury and undue wear as the Valve is being closed or opened. In closing the Valve the Discs descend free and clear of the Seats until the Lower Wedge reaches the boss in the bottom of the Case and

the Discs then being in front of the seats, further downward movement of the Upper Wedge forces the Discs squarely | Stem, Flanged End Gate Valve.



Valve illustrated is an Iron Body Bronze Mounted, Inside Screw Stationary

THE EDWARD VALVE AND MANUFACTURING CO.

72 W. ADAMS ST., CHICAGO, ILL.

Boston New York

BRANCHES AT PHILADELPHIA

PITTSBURGH SAN FRANCISCO

Manufacturers of High Grade Valves and Fittings for High Pressures and Temperatures or Other Severe Service

EDWARDS VALVES:

The following gives, in brief form, the specifications of some of Edward Valves:

STOP VALVES

Body	Internal Working Parts	For Temperatures up to (Degrees Fahr.)	For Pressures up to (Lbs.)
Cast Iron	Hard Steam Metal	400	200
Steel	Monel Metal	750	300
Semi-Steel	Hard Steam Metal	480	250
Bronze	Monel Metal	600	300
	Hard Steam Metal	400	175
Forged Steel	Monel Metal	750	300

NON-RETURN VALVES

Cast Iron	Hard Steam Metal	400	200
Steel	Monel Metal		300
Semi-Steel	Hard Steam Metal	400	250

BLOW-OFF VALVES

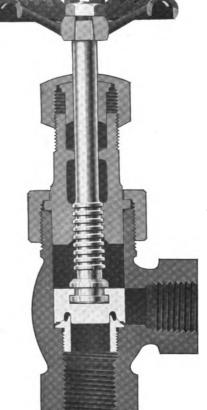
Cast Iron	Hard Steam Metal	200
Steel	Monel Metal	300
Semi-Steel	Hard Steam Metal	250

DRUMHEAD STOP AND CHECK VALVES

Steel .	Monel Metal	 300
Semi-Steel	Hard Steam Bronze	300
Bronze	Hard Steam Bronze	300

CHECK VALVES

Cast Iron	Hard Steam Bronze	II	200
Steel	Extra Hard Steam Bronze		300
Semi-Steel	Extra Hard Steam Bronze		250
Bronze	Extra Hard Steam Bronze		300
Brass	Good Grade of Brass		175



Edward Angle Valve

Also manufacturers of-

Water Relief Valves

Reducing Valves

Multiple Leaf Pump Valves

Pump Governors

Send for complete catalog.

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FORD REGULATOR CORPN.

1830 LYTTON BLDG., CHICAGO, ILL.

403-407 Broome St., NEW YORK, N. Y.

Manufacturers of The "Ford" Steam and Water Valve Specialties



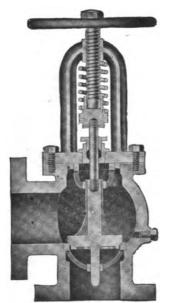
TRADE MARK

THE "FORD" AUTOMATIC STOP AND CHECK VALVE:

(Pat. 1916)

A genuine improvement in non-return valves, the construction positively removing the objections encountered in the earlier types, sticking and chattering.

190



Patented 1916

Sticking is caused by unequal expansion in the dash-pot. The "FORD" Valve has no dash-pot.

Chattering is caused usually by a dashpot made of too free and loose a fit, in order to minimize sticking. The "FORD" Valve employs an entirely different principle, which not only tries to avoid chattering, but which does avoid chattering.

As the "FORD" Valve is without dashpot, we went about the prevention of chattering from a different angle. Most valves are balanced. causing an equilibrium at a certain opening of piston. The "FORD" Valve is unbalanced and therefore does not possess the tendency to chatter. Furthermore, we figured the value of an abron or piston choke-off "A," so that by the time steam is flowing from boiler into main in any appreciable quantity, the valve disc itself is far enough from its seat to make wire-drawing an impossibility.

It is adjustable for sensitiveness to checking, a feature contained in no other valve.

Superheated steam: "FORD" construction produces the ideal valve for superheat work. Contains not a single snug fit to stick under extreme temperatures.

Triple Duty Valves a trifle more intricate, of course, but a marvel of simplicity for the complex service involved.

Send for blue prints of

THE VALVES THAT CANNOT STICK

Pump Regulating Valves

High Pressure Tank Float Valves

Steam and Water Reducing Valves, Etc.

COMPLETE THE "FORD"
LINE

CATALOG ON REQUEST



Pump Regulating Valve

HOMESTEAD VALVE MFG. CO.

P. O. BOX 1754, PITTSBURGH, PA.

NEW YORK OFFICE: No. 242 Lafayette St., NEW YORK CITY

Manufacturers of Homestead Valves and Other Specialties

HOMESTEAD (Quarter Turn) PLUG VALVES:



The first illustration shows our Homestead Straightway Valve, with flanged

connections. This pattern is used extensively as a boiler blow-off valve.

Homestead Valves are equally serviceable on all kinds of exacting or high pressure work.

The three-way and four-way valves as shown on

the second and third illustrations are used as operating valves on air, water,

steam and for many other purposes.

Homestead Valves are so constructed that they open and close with a quarter turn, operate easily and are free from leakage through the valve, the stuffing box or body.



HOVALCO (Blow-Off) VALVE:

The valve here shown is a new pattern angle blow-off valve, semi-steel body, and special composition seat. The disc and seat are reversible, renewable and can be

reground. Note the accessibility and the ease with which the parts of this valve can be renewed.

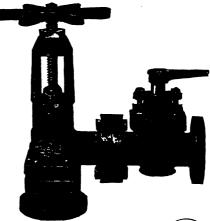
Figure below shows the "Homestead" and "Hovalco" valve combined. For boiler blowoff purposes, no better arrangement can be secured. The advantages of the double blow-off arrangement are many, the "Hovalco Valve"



"Hovalco" Valve

can be repaired or renewed at any time 191 without closing down the boiler. This is done by closing the "Homestead Cock," while the repairs are being made. The best power plants being built are specifying this arrangement of blow-off valves.

In accordance with the A. S. M. E. Boiler Code.



"Homestead" and "Hovalco" Valves Combined Catalogue of our complete line sent upon request.



JARECKI MANUFACTURING CO.

ERIE, PA.

Manufacturers of Cast Iron, Malleable and Brass Pipe Fittings; Brass and Iron Valves and Cocks, Etc., for Steam, Gas, Water, Air and Oil—Governors—Pipe Threading Tools—Oil Well Supplies

MALLEABLE, CAST IRON AND BRASS PIPE FITTINGS. Screwed and Flanged. Standard, Extra Heavy and Hydraulic.





Malleable Fitting

Cast Iron Fitting

MALLEABLE LIP UNIONS, BRASS GROUND JOINT UNIONS, Standard, Extra Heavy and Hydraulic.

192



Brass Union, Polished

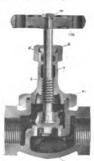


Brass Globe Valve

BRASS AND IRON VALVES AND COCKS, Standard, Medium, Heavy and Hydraulic, Globe, Angle, Cross, Check, Gate and Regrinding.



"U Clamp" Gate Valve



Nickel (or Hard Bronze) Seat and Disc Valve



Iron Body Globe Valve

IRON BODY VALVES, Plain and Yoke Top, Brass Mounted, Brass and Steel Stem, Screwed and Flanged, Standard, Extra Heavy and Hydraulic.



Iron Body Engine Valve



Iron Body Gate Valve

IRON AND BRASS FLANGE UNIONS, Expansion Joints.

JARECKI MANUFACTURING CO.

Air Compressor Governors

Vacuum Pump Governors





Erie Compressor Governor

Erie Compressor
Unloader maintains
practically a constant
air pressure, completely unloads and
loads compressor
without shock or
strain.



Erie Unloader for All Styles of Air Compressors

ERIE SCREW PLATE AND PIPE CUTTER:



Rise Sciem Plate

Has adjustable self-centering dies and guides. Each set of dies threads four or more sizes of pipe. Plate can be detached from finished work without turning back on thread.

Ratchet Screw Plate for threading pipe in corners and ditches.

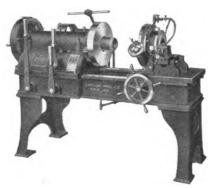
MALLEABLE PIPE VISE:



Pipe Vise

By means of the hinged beam which holds upper jaw pipe can be placed in vise at any point; made in four sizes to take pipe from 1/8" to 12".

JARECKI PIPE THREADING MACHINES:



Pipe Threading Machines

Hand, Belt, Steam Engine or Electric Motor Drive.

There are 21 different styles and sizes of these machines, each threading and cutting eight to twelve different sizes of pipe. The machine shown is our No. 44, which threads and cuts eight different sizes of pipe, from 1" to 4". Each size pipe should be threaded at a certain speed to get the best and most economical results. These eight speeds are instantly obtained by three vertical levers on operator's side of the machine.

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JENKINS BROS.

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SAN FRANCISCO

Manufacturers of Valves in Brass, Iron and Cast Steel; Sheet Packing, Gaskets, Discs, Pump Valves and other Mechanical Rubber Goods

JENKINS BRASS VALVES:



Jenkins Brass Globe, Angle and Cross Valves, Standard Pattern, with Jenkins Renewable Discs, suitable for working steam pressures up to 150 pounds, or 250 pounds water. Regularly made in sizes 1/8 to 3 inches, screwed or flanged. Larger sizes in brass made from iron body patterns.

Fig. 106 Brass Globe Valve Standard Pattern

Jenkins Hose End Globe and Angle Valves,

with Jenkins Discs of flexible rubber composition insuring tightness under cold water pressures up to 250 pounds. Sizes 1/2 to 3 inches, with or 194 without cap and chain, in any style of finish required.



Fig. 114

Jenkins Brass Horizontal An- Brass Hose gle, and Vertical Check Valves Angle Valve

correspond to same standard as the Standard Pattern Globe and Angle Valves. Regularly furnished with Jenkins Discs of semi-hard composition which will soften slightly under the action of hot water. When specified for cold water, air or gas, a soft, flexible rubber disc is supplied, suitable for 150 pounds working pressure. Sizes 1/8 to 3 inches, screwed or flanged.



Fig. 352 Check Valve flanged.

Jenkins Brass Swing Check Valves are made with globe-shaped bodies. Adapted for either horizontal or vertical installation. Furnished with Jenkins Disc, suitable for 150 pounds pressure. Brass Swing Sizes 1/4 to 3 inches, screwed or



Fig. 124 Brass Y Valve Standard Pattern

Jenkins Brass "Y" Valves, besides their extensive use for blow-off service. are particularly desirable for handling muddy and gritty water, and thick, heavy fluids. Sizes 3/8 to 3 inches, screwed or flanged.



Fig. 370 Brass Gate Valve Standard Pattern

Jenkins Brass Gate Valves, Standard Pattern, especially desirable for plumbing or other service under working pressures 125 pounds steam or 175 pounds water. Made both inside screw and outside screw and yoke. Regularly have rough body, finished trimmings; but polished, nickel plated, wood wheel, brass wheel, or other special finish furnished when so ordered. Sizes 1/4 to 3 inches, screwed or flanged.

Jenkins Brass Gate Valves, Medium Pressure, are especially designed for steam, or hot and cold water lines where high grade installation is required but pressure carried does not warrant use of the more expensive extra heavy pattern. They guaranteed for 175 pounds steam, 250 pounds water. Sizes ¼ to 3 inches.



Fig. 270 Brass Gate Valve Medium Pressure

JENKINS IRON BODY VALVES:



Fig. 142 Iron Body Globe Valve, Standard Pattern

Jenkins Iron Body Valves, Standard Pattern, are heavier and considerably stronger than the average iron body valves. Have Jenkins Discs and renewable seat rings. Suitable for working pressures 150 pounds steam or 250 pounds water. Globe

and angle valves; sizes 2 to 24 inches inclusive; cross valves up to 8

inches; horizontal, and angle vertical check valves 2 to 8 inches; all iron valves from 1/2 inch up; back pressure valves in various patterns and sizes: standard pattern gate valves, with solid double-faced wedges, 2 to 30 inches; medium pressure, 2 to 18 inches, with or without by-Flanges, A. S. M. E. standard dimensions.



Fig. 325 Iron Body Gate Valve, Pattern

JENKINS BROS.

JENKINS VALVES FOR HIGH PRESSURE:



Fig. 128 Brass Globe Valve, Extra Heavy Pattern

Jenkins Extra Heavy Brass Valves, Globe, Angle, Cross, Check and other patterns, are suitable for working steam pressures up to and including 300 pounds, or for water and air pressures up to 500 pounds. Carefully designed, well proportioned, handsomely finished, with the most approved features of construction. Sizes 1/4 to 3 inches.

Jenkins Extra Heavy Brass Gate Valves furnished either inside Screw, Stationary Spindle

or Outside Screw and Yoke. Rising Spindle. Sizes 1/2 to 3 inches

Jenkins Extra Heavy Iron Body Valves are suitable for working pressures of 250 pounds steam or 400 pounds water.

Globe, angle and cross valves made in sizes 2 to 12 inches; valves from 5 inches up can be supplied with by-passes which are cast integral with the body.

Horizontal and angle check valves 2 to 6 inches; swing check valves, 2 to 8 inches; Y valves, 2 to 3 inches; automatic equalizing stop and check valves, 4 to 8 inches.

Gate valves with inside screw or outside screw and voke, in sizes 11/2 to 24 inches. Valves can be furnished with bypasses, and their use is particularly recommended on sizes 8 inches and larger. All flanges, A. S. M. E. Extra Heavy Dimensions.



Fig. 204
Iron Body Gate Valve,
Extra Heavy Pattern
Outside Screw and



Fig. 164c Iron Body Angle Valve with By-

Pass, Extra Heavy Pattern

Fig. 204b Iron Body Gate Valve with By-Pass, Extra Heavy Pattern

JENKINS CAST STEEL VALVES:

Jenkins Cast Steel Valves are made in globe, angle, gate and check patterns, which experience has shown are perfectly adapted for the severe conditions incident to high pressure superheated steam service. The valves are suitable for working steam pressures up to 350 pounds, and total temperature of 800 degrees F. Furnished in practically the same sizes as the Extra Heavy Iron Body Valves.



Fig. 293 Automatic Equalizing
Stop and
Check Valve

MECHANICAL RUBBER GOODS:

In this line we are offering engineering requisites which are the result of over 50 years of progressive effort. We are the original manufacturers of rubber composition discs for valves and unvulcanized sheet packing.

Jenkins '96 is the name of our black high grade unvulcanized or self-vulcanizing packing, furnished in sheets or gaskets, and unsurpassed for all kinds of saturated steam joints. JEN-ARCO is a vulcanized red sheeting. It is very 195

tough and pliable, equally suitable for steam, hot or cold water, and other ioints

Jenkins compressed Asbestos Jointing for Superheated Steam joints.





Fig. 227 Pump Valve

from various compounds. There are pump valves of hard composition, particularly adapted for hot water, as with boiler feed pumps; for oils, acids, and other destructive fluids; semi-hard valves for high pressure cold water service as in mines and elevators, medium soft for cold water, very soft and flexible for low pressure cold water and air. When ordering, state the kind of service in which the valves are to be used, the fluid handled, pressure or head pump is working against, and in all cases give diameter, thickness and size of hole.

All genuine Jenkins Valves bear Diamond Trade Mark, and are absolutely guaranteed to be perfect in workmanship and suitable and efficient in the service for which they are designed.



A catalogue of all the Jenkins products, giving sizes, styles and list prices, mailed on request.



THE KELLY & JONES CO.

GREENSBURG, PA.

Manufacturers of Cast Iron, Malleable, Brass and Steel Fittings; Brass, Iron Body and Steel Valves, Cocks, Etc., for Steam, Gas, Water, Air and Oil

CAST IRON, MALLEABLE AND **BRASS FITTINGS:**

We make every conceivable style and size of screwed cast iron, malleable, brass and steel fittings and for all pressures.



Malleable Fitting

Kelly &

196

Jones Co. screwed fittings are recessed to permit of the easy entrance of the pipe. All threads are cut true to gauge. Will not leak and each fit-

Cast Iron Fitting

ting is a perfect product.

FLANGED FITTINGS:

We make a a flanged fitting for every pressure and purpose, brass, iron or steel, and in all sizes, straight or reducing.



Flanged Fitting



Reducing Flanged Fitting

Dimensions and drilling of Kelly & Jones Co. fittings are in accordance with the latest established standards.

"NIP" UNION:

No Inserted Parts

This is one of the simplest Unions made-has only three parts-Nut, Swivel and Thread End.

Nut and Swive are made of Malleable Iron, and Thread End of Brass. This brass to iron seat and



"Nip" Union

thread connection insures a tight joint and permits the union to be reconnected any number of times without injury.

Made in sizes 1/8 to 4" for 200 pounds working

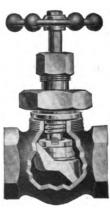
JENKINS TYPE KELLY & JONES **BRASS VALVES:**

Practical - durable - efficient - economical. Will not leak and can be repacked under full pressure. These K-J Jenkins type brass valves are made of the highest grade steam metal, carefully machined, and are very attractive in appearance. Special pattern for 100 lbs., standard for 125 lbs.

Furnished in globe, angle, cross and check, screwed or flanged, and in all sizes.

"EXCELSIOR" HIGH PRESSURE **BRASS VALVES:**

For high pressure service, 200 or 300 lbs, of live or superheated steam. Used extensively in modern steam plant construction and in the U.S. Navy. Can be furnished with or without yoke, screwed or flanged, globe, angle, cross and check. Sizes 1/8" to 4".



"Excelsior" High Pressure **Brass Valve**

THE KELLY & JONES CO.

Send for Catalog "R" illustrating and describing our complete line of valves and fittings.

BRASS GATE VALVES:

The Kelly Jones line of brass gate valves is most complete. Correctly designed and well proportioned and can be furnished screwed or flanged for the following pressures: 100 lbs., 125, 150, 175, 200, 250 and 1000 lbs. Made with outside screw and yoke if desired for 125 or 250 lbs. pressure.

In addition to the solid wedge type illustrated we make brass gate valves with the double disc, either parallel or taper seats.

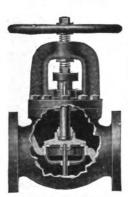


Brass Gate Valve

IRON BODY VALVES:

All styles and sizes for all pressures and purposes including globe, a n g l e, cross, check and safety valves. S c r e w e d or flanged, inside screw or O. S. & Y.

K. & J. blowoff valves, globe
or angle, screwed
or flanged, perform their function correctly
and positively,
and thereby prolong the life of
the boiler Built
on scientific principles and have
been in satisfactory use for
years.



Iron Body Globe Valve



Globe Blow-Off Valve

Our NEW STEEL FOUNDRY is fully equipped for making in "high quality" steel, any of the valves or fittings shown in our general catalog.

"SADDLE" GATE VALVES:

All Iron or Iron Body Brass Mounted

This saddle style is a very durable and compact valve, and economical, owing to the simplicity of construction. The steel saddle around the body of the valve holds the bonnet securely in place, and can easily be removed, permitting of access to the interior of the valve for cleaning or repair purposes. Opens to the left and has a rising spindle.



"Saddle"

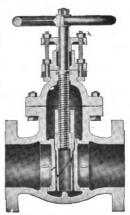
The solid disc in this valve is very 197 narrow and V-shaped at the bottom, and can, therefore, be seated more readily when dirt and sediment are collected between the seats in the valve. Screwed or flanged, sizes ½" to 6".

IRON BODY GATE VALVES:

Solid Wedge or Double Disc

Our iron body gate valves can be furnished screwed or flanged, with or without yoke and by-pass and for 25, 125, 175, 250 and 1000 lbs. pressure.

These valves are also made all iron for temperatures exceeding 325° Fahrenheit and for handling cyanides, acids and other solutions injurious to brass.



Iron Body Gate Valve Double Disc

THE LUNKENHEIMER CO.

EXECUTIVE OFFICES AND FACTORIES

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NEW YORK

CHICAGO

BOSTON

London

129-135 Lafayette St. 188 N. Dearborn St. 136-138 High St. 35 Great Dover St., S. E.

Manufacturers of High Grade Engineering Specialties

PRODUCTS:

Valves

Bronze Engine Throttle Safety Non-return Stop Check Iron Cast Steel Needle Anti-acid Globe Radiator Regulating Check Angle Blow-off Cross Pop Safety Check Gate Relief

Lubricators

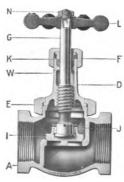
For Steam, Gas, Gasoline and Diesel Engine and Compressor Cylinders.

Oil and Grease Cups
Oil Pumps
Oiling Devices
Injectors and Ejectors
Water Columns and G

Water Columns and Gauges
Gauge Cocks
Whistles
Ground Key Work
Low Water Alarms
Fusible Plugs
Unions
Bronze Pipe Fittings
Motor Accessories

Generator Valves Carburetor Check Valves Gasoline Engine Primers Priming Cups Gasoline Stainers Unions and Cocks, etc.

BRONZE REGRINDING GLOBE, ANGLE AND CROSS VALVES:



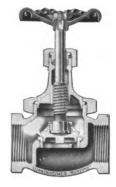
Materials: Body and trimmings of "Valve-Bronze."

Patterns: Medium, sizes 1/8 to 4 inches, for 200 pounds, and Extra Heavy, sizes 3/8 to 4 inches, for 300 pounds working steam pressure. Also procurable in Outside Screw, Flanged or Screw Yoke Patterns.

Features: Seating surfaces regrindable; all parts renewable; stuffing box repackable under pressure when valve is wide open; flow areas in excess of pipe areas.

Write for descriptive Booklet No. 517-A.

BRONZE "RENEWO" GLOBE, ANGLE AND CROSS VALVES:



Materials: Body and majority of trimmings of "Valve-Bronze;" seat and disc of "Valve-Nickel."

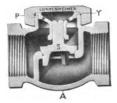
Patterns: Medium for 200 pounds and Extra Heavy for 300 pounds working steam pressure, in sizes ½ to 3 inches inclusive. Also procurable in Outside Screw Flanged Yoke Pattern.

Features: Seating surfaces regrindable, all parts renewable including the nickel seat and disc, making these valves practically indestructible; seating surfaces self-cleansing; stuffing box repackable under pressure when valve is wide open; self-cooling handwheel; flow areas in excess of pipe areas.

Write for descriptive Booklet No. 535-A.

THE LUNKENHEIMER CO.

BRONZE REGRINDING HORIZONTAL ANGLE AND VERTICAL CHECK VALVES:



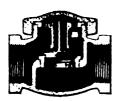
Materials: Body and trimmings of "Valve-Bronze."

Patterns: Medium sizes 1/8 to 4 inches inclusive, for 200 pounds, and Extra Heavy, sizes 1/4 to 4 inches inclusive, for 300 pounds working steam pressures. Also procurable with flange instead of screw cap.

Features: Disc properly guided at both top and bottom, insures perfect seating; seating surfaces regrindable; all parts renewable; flow areas in excess of pipe areas.

Write for descriptive Booklet 517-A.

BRONZE "RENEWO" HORIZONTAL AND ANGLE CHECK VALVES:



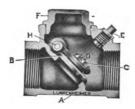
Materials: Body, cap and disc guide of "Valve-Bronze;" seat and disc of "Valve-Nickel."

Patterns: Medium for 200 pounds, and Extra Heavy for 300 pounds working steam pressures, sizes 1/4 to 3 inches inclusive.

Features: Disc properly guided at both top and bottom insures perfect seating; seating surfaces regrindable; all parts renewable including the nickel seat and disc, making these valves practically indestructible; flow areas in excess of pipe areas.

Write for descriptive Booklet 535-A.

BRONZE SWING CHECK VALVES:



Materials: Body and trimmings of "Valve-Bronze."

Patterns: Medium for 200, and Extra Heavy for 300 pounds working steam pressures, sizes 1/4 to 3 inches inclusive. Also procurable with flange instead of screw cap.

Features: Practically straightway flowchannel with flow areas in excess of pipe areas; two renewable disc-carrier bearings, insuring constant alignment of disc; seating surfaces regrindable; all parts renewable.

Write for descriptive Booklet 517-A.

BRONZE DOUBLE DISC GATE VALVES:



Materials: Body and trimmings of "Valve-Bronze."

Patterns: Medium, sizes ¼ to 3 inches inclusive, for 150 pounds working steam pressure.

Features: Ball and socket bearing between the discs provides greatest degree of flexibility in seating engagement; all parts renewable; stuffing box repackable under pressure when valve is wide open; pressure can be taken from either

Write for Booklet 574-A.

(Continued on next page)

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(Continued from preceding pages)

THE LUNKENHEIMER CO.

CINCINNATI, OHIO

BRONZE WEDGE DISC GATE VALVES:



200



Materials: Body and trimmings of "Valve-Bronze."

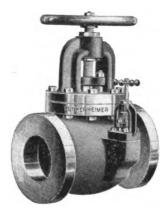
Patterns: Screwed Bonnet Inside Screw, Medium Pattern, sizes ¼ to 3 inches inclusive, for 200 pounds, and Extra Heavy, sizes ½ to 3 inches inclusive, for 300 pounds working steam pressures; Screwed Yoke Outside Screw, Medium Pattern, sizes ¾ to 3 inches inclusive, for 200 pounds, and Extra Heavy, sizes 1 to 3 inches inclusive, for 300 pounds working steam pressure. Bolted Bonnet Inside Screw and Bolted Yoke Outside Screw, sizes 2 to 8 inches inclusive,

Medium Pattern for 125 pounds and Extra Heavy for 250 pounds working steam pressures.

Features: Double seated permitting pressure to be taken from either end; stuffing box repackable under pressure when valve is full open; all parts renewable including the seats on all sizes with exception of ½ to ¾ inch inclusive.

Write for Booklet 574-A.

IRON BODY BOLTED YOKE GLOBE, ANGLE AND CROSS VALVES:



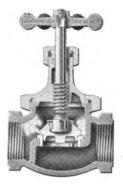
Materials: Body, bonnet or yoke of "Valve-Iron." Bearing parts of "Valve-Bronze." Also furnished with Cast Steel body, bonnet or yoke and with seat and disc of "Valve-Nickel."

Patterns: Standard Pattern, sizes 2 to 12 inches inclusive, for 125 pounds working steam pressure; Heavy Pattern, sizes 2 to 8 inches inclusive, and with Interior By-pass, 3½ to 12 inches inclusive, for 175 pounds working pressure; Extra Heavy Pattern, sizes 2 to 8 inches inclusive, and with Interior By-pass, 3½ to 12 inches inclusive, and Exterior By-pass, 5 to 12 inches inclusive, for 250 pounds working steam pressure.

Features: Seating surfaces regrindable; all parts including the seat and disc renewable; self-cleansing seating surfaces; stuffing box repackable under pressure when valve is wide open; flow areas in excess of pipe areas.

THE LUNKENHEIMER CO.

IRON BODY "FERRENEWO" GLOBE, ANGLE AND CROSS VALVES:



Materials: Body of "Valve-Iron;" seat and disc of "Valve-Nickel;" other trimmings of "Valve-Bronze."

Patterns: Screw Ends only. For 150 pounds working steam pressure.

Features: Self-cleansing seating surfaces; regrindable seating surfaces; all parts renewable including the nickel seat and disc; stuffing box repackable under pressure when valve is wide open; flow area in excess of pipe areas.

Write for Booklet 567-A.

TRON BODY "FERRENEWO" CHECK VALVES:



Materials: Body of "Valve-Iron;" seat and disc of "Valve-Nickel;" disc-guide and cap of "Valve-Bronze."

Patterns: Screw Ends only, sizes 1/4 to 2 inches inclusive, for 150 pounds working steam pressure.

Features: Disc properly guided at both top and bottom insures perfect seating; seating surfaces regrindable; all parts renewable including the nickel seat and disc; flow areas in excess of pipe areas.

Write for Booklet 567-A.

IRON BODY HORIZONTAL AND ANGLE CHECK VALVES:



Materials: Body and cap of "Valve-Iron;" seat, disc and disc-guide of "Valve-Bronze." Also furnished with seat and Bronze." Also furnish disc of "Valve-Nickel."

Patterns: Standard Pattern, sizes 2 to 12 inches inclusive, for 125 pounds working steam pressure; Extra Heavy Pattern, sizes 2 to 8 inches inclusive, for 250 pounds working steam pressure.

Features: Disc properly guided at 201 both top and bottom insures perfect seating; seating surfaces regrindable; all parts renewable including the seat and disc; flow areas in excess of pipe areas

IRON BODY SWING CHECK VALVES:



Materials: Body and Cap of "Valve-Iron." Bearing parts of "Valve-Bronze." Also procurable with Cast Steel body and cap. Seat and disc may be had of "Valve-Nickel."

Patterns: Standard Pattern for 125 pounds working steam pressure and Extra Heavy for 250 pounds working steam pressure, sizes 2 to 8 inches.

Features: Practically straightway flow-channel. Two bronze side plugs provided as disc carrier bearings which are renewable as are all other parts; seating surfaces regrindable.

(Continued on next page)

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(Continued from preceding pages)

THE LUNKENHEIMER CO.

CINCINNATI, OHIO

IRON BODY "VICTOR" GATE VALVES:



202

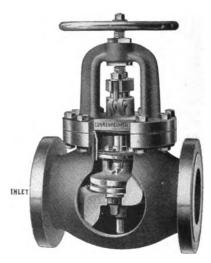
Materials: Body, bonnet or yoke of "Valve-Iron." Bearing parts of "Valve-Bronze." Can be procured with seat and disc of "Valve-Nickel" or body, yoke or bonnet can be had of Cast Steel.

Patterns: Standard Pattern, sizes 2 to 8 inches inclusive, for 125 pounds working steam pressure and sizes 10 to 24 inches inclusive for 100 pounds working steam pressure. Medium Pattern, sizes 2 to 24 inches inclusive, for 125 pounds working steam pressure. Heavy Pattern, sizes 2 to 24 inches inclusive, for 175 pounds working steam pressure. Extra Heavy Pattern, sizes 1½ to 16 inches inclusive, for 250 pounds working steam pressure. Extra Heavy Pattern can be had with By-pass in 5 inch and larger sizes. Made with Inside Screw Stationary Stem and Outside Screw Rising Stem. Can be procured in Sliding Stem Pattern for quick opening and closing; with Angle Outlet; Stationary Stem Pattern with Indicator to show degree of opening; with Gear Lift; with Hydraulic Lift, or Electrically Operated.

Features: Wedge Disc, double seated permitting pressure to be taken from

either end; all parts including the seat and disc are renewable; stuffing box repackable under pressure when valve is wide open.

IRON BODY
BALANCED THROTTLE VALVES:



Materials: Body and yoke of "Valve-Iron." Bearing parts of "Valve-Bronze." Can be procured with seat and disc of "Valve-Nickel" or body and yoke can be had of Cast Steel.

Patterns: Globe or Angle Patterns with Flange Ends only, sizes 4 to 10 inches, for 250 pounds working steam pressure.

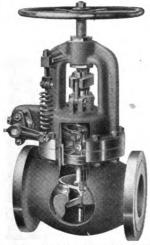
Features: Simplicity of construction combined with efficiency make these Valves particularly adapted for engine throttling purposes. Interior By-pass facilitates operation; spring seating surfaces accommodate themselves to any slight distortions caused by expansion and contraction; seating surfaces regrindable; all parts including seat and disc are renewable; can be connected with stem pointing vertically upward or horizontally.

Write for Booklet 579-A.

(Continued from preceding pages)

THE LUNKENHEIMER CO.

IRON BODY SAFETY NON-RETURN VALVES:



Materials: Body and yoke of "Valve-Iron." Bearing parts of "Valve-Bronze" can be procured with seat and disc of "Valve-Nickel," or body and yoke can be had of Cast Steel.

Patterns: Globe or Angle Patterns with Screw or Flange Ends for 250

pounds working steam pressure.

Features: Will automatically close and

instantly cut out the boiler in battery to which it is connected should the pressure within the boiler suddenly drop below that in the header; permits continued operation of other boilers in battery; will not open until pressure in boiler equals that in header; can be connected with stem pointing vertically upward or horizontally; self-cleansing seating sur-faces; seating faces regrindable; all parts including seat and disc renewable.

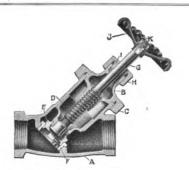
Write for Booklet 525-A.

BRONZE "RENEWO" STRAIGHTWAY BLOW-OFF VALVES:

Materials: Seat and Disc of "Valve-Nickel;" other trimmings and body of "Valve-Bronze."

Patterns: Medium for 200 and Extra Heavy for 300 pounds working steam pressures, in sizes 34 to 21/2 inches in-

Features: Self-cleansing seating surfaces; regrindable seating surfaces; all parts renewable including nickel seat and disc; stuffing box repackable under pressure when valve is wide open.



Write for Booklet 535-A.

IRON BODY "DURO" BLOW-OFF VALVES:

Materials: Body and yoke of "Valve-Iron." Bearing parts of "Valve-Bronze."

Patterns: Screw or Flange Ends for 250 pounds working steam pressure, sizes $1\frac{1}{4}$ to $2\frac{1}{2}$ inches inclusive.

Features: Self-cleansing seating surfaces; disc reversible and provided with two alloy faces which can be melted out and new alloy inserted; all parts, including seat, are renewable. A combination extensively used is that of the "Duro" with a "Victor" Gate Valve bolted between it and the boiler. The Gate Valve serves as a safety device in event of accident to the Blow-off Valve and enables repairing of the latter while the boiler is under pressure.

Write for Booklet 515-A



NELSON VALVE CO.

CHESTNUT HILL, PHILADELPHIA, PA.

NEW YORK WASHINGTON PHILADELPHIA CLEVELAND DETROIT

SALES OFFICES CHICAGO SYRACUSE MINNBAPOLIS

PITTSBURGH NEW ORLEANS

BOSTON SAN FRANCISCO

Manufacturers of Valves in Bronze, Iron and Steel, Gate, Globe, Check, Non-Return, Back-Pressure and Motor-Operated Valves

Nelson Valves meet every requirement of the highest class Power and industrial installation. They include all types of valves usually employed high in pressure saturated lines, low pressure steam, air and exhaust lines. Also valves for acids.

1

alkalies, oils and other special industrial service.

Fig. 1554 Steel Gate Valve

204

Nelson Valves have earned with 20 years of service the confidence that engineers, and in fact all users of valves, have in them. And it is the aim of the Nelson Valve Company to con-

tinue to merit this confidence.

STEEL VALVES:

Nelson Steel Gate Valves represent the highest standards in steel valve construction. The No. 1554 line is full monel mounted, with high bonnet and condensing chamber, Nelson flexible double-disc gate and taper seat, cork grip hand-wheel and other important engineering features. These valves are recommended for steam working pressures up to 350 lbs. and temperatures up to 800 degrees. Other types of steel gate valves are made for low superheat, feed water, etc.

Nelson Steel Globe Valves are designed to meet the best engineering specifications and to provide great strength and reliability. Cast yoke and marine yoke types are made with monel mountings for high pressure and high superheat. Other Steel Angle Valve



types are provided for low superheat. All bonnets have through bolts.

Nelson Steel Non-Return Valves are extremely simple, providing effective and dependable protection for batteries of boilers. The number of parts is minimized, leaving nothing to work loose or get out of adjustment. They are heavily built and either mounted fully in monel metal for high superheat, or special bronzes for low superheat.

Metal Special Valves for Superheat in small sizes for drips and auxiliary lines are provided to supplement the above





Fig. 1370, Sectional View Steel Non-Return Valve

NELSON VALVE CO.

IRON VALVES:

For High Pressure Saturated Steam, water and other fluid lines, there is a complete range of Nelson types and sizes including:





Fig. 530 Extra Heavy Iron Gate Valve

Fig. 620 Extra Heavy Iron Globe Valve

Gate Valves with the Nelson flexible double-disc, taper-seat construction, in stationary stem and rising stem patterns, with and without by-pass.

Globe Valves sturdily built of heavy parts with through-bolted bonnets and features of design insuring accurate, permanent alignment of parts and long, satisfactory service.

Non-Return Valves of the same simple design as the steel non-return valve, heavily built and thoroughly dependable as a protection on batteries of boilers.

Swing Check Valves supplementing the above lines in every detail of service qualities.

For Medium Pressures there are inside and outside screw gate valves, globe and angle valves, bronze mounted, built especially to meet the needs of this class of service.

In Standard 125 lbs. working pressure and light pressure valves, there is a valve for nearly every purpose, including gates, regrinding and composition disc globes, checks and back-pressure valves.

BRONZE VALVES:

Nelson bronze valves are made of exceptionally high quality metal mixtures, under a thorough system of manufacture, inspection and test. Castings are clean, sound and of good color, and all working parts, threads and hexes of valves are of liberal proportions, providing a good reserve of strength above regular working requirements.

Gate Valves include standard, medium and extra heavy types of Nelson doubledisc, taper-seat design, and extra heavy outside screw and yoke gate valves.

Globe Valves include standard re- 205 grinding valves, heavy union bonnet valves and heavy composition disc valves.

Check Valves include swing checks, horizontal checks and vertical checks.







Fig. 47 Heavy Union Bonnet Globe Valve

Catalog of Nelson Valves, showing the complete line, with specifications and prices will be sent on request.

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PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

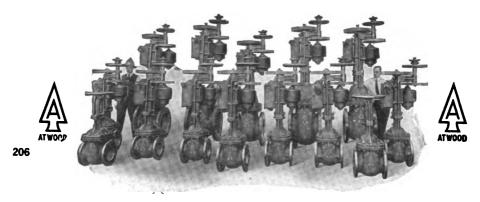
P. O. BOX 1016, PITTSBURGH, PA.

Engineers, Founders, Pipe-Fitters and Machinists Sole Manufacturers of Gulland Automatic Stand Pipes

BRANCH OFFICES AND AGENTS

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CHICAGO, ILL., 650 McCormick Bldg.
DENVER, COLO., Mountain States Mach. Co.
PHILADELPHIA, PA., 1323 Widener Bldg.
SAN FRANCISCO, CAL., E. A. Keithley, Rialto
Bldg.
TORONTO, CANADA, W. M. Campbell, 32 Albany
Street



Group of Motor-Operated Gate Valves

VALVES, FITTINGS AND APPLIANCES of every description for Steam, Gas, Water, Air and Hydraulic Piping.

SPECIAL VALVES AND FITTINGS for hydraulic installations. Motor Operated and Cylinder Operated Gate Valves, Hydraulic Operating Valves for blast furnace doors, bells, steel mill tables and rolls.

COMPLETE PIPING CONTRACTS EXECUTED:

We are prepared to install valves, fittings or piping anywhere and under any conditions. A large corps of expert fitters is constantly employed, and this branch of work is in charge of competent superintendents and foremen. Large con-

tracts are placed in charge of erecting engineers from the Engineering Department.

Special facilities for casting and machining large pipe fittings, furnace castings, etc.



16" Welded Header with 18-4" Branches

PIPE CUTTING, BENDING AND WELDING:

Branches and manifold outlets fabricated by our patented Interlock Method.



SEE

PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

STANDARD LINES OF GATE VALVES:

Specifications for material

Grey Iron—22,000 lb. per sq. in. tensile strength.

Semi Steel—33,000 lb. per sq. in. tensile strength.

Parallel seat, 50 lb. working pressure. 75 lb. test pressure

Sizes 14" to 72" cast iron. Low pressure. For water, gas, air or exhaust steam. tremely close face to invaluable in face, complicated piping connections.

Parallel seat, 125 lb. working pressure. 300 lb. ing pressure.

Sizes 2" to 48" cast iron. Standard pressure For water, air,

50 lb. Parallel Seat Gate Valve. Close Pattern

steam or gas. Fully bronze mounted. Especially adapted to water distribution.

Parallel seat, 200 lb. working pressure. 400 lb. test pressure

Sizes 11/2" to 16" cast iron. Largely used for natural gas under the lower pressures. Furnished either all iron or iron body bronze mounted.

Parallel seat, 400 lb. working pressure. 800 lb. test pressure

Sizes 3" to 20" semi steel. In extensive use for the transmission of natural gas. Furnished either with or without bronze mountings.

Parallel seat, 500 lb. working pressure. | 1500 lb.



" 1000 lb. Gas Line GateValve

Sizes 2" to 12". For water or oil at pressure noted. Semi steel with solid bronze mountings.

Parallel seat, 1000 lb. working pressure. lb. test pressure.

Sizes 2" to 12" semi High pressure steel. gas valve used chiefly at the gas wells and on feeders in the gas fields.

Parallel seat, 1500 lb. working pressure. 2000 lb. test pressure

Sizes 2" to 10" semi steel. For hvdraulic service and extreme natural gas rock pressures.

Taper seat, 175 lb. working pressure. 500 lb. test pressure

Sizes 2" to 16" semi steel. A valve for medium steam pressures from 125 lb. to 175 lb. where a less expensive valve than the 250 lb. type is desired.

Taper seat, 250 lb. working pressure. 800 lb. test pressure

Sizes 11/2" to 28" of semi steel with solid bronze mountings for ordinary steam pressures. Sizes 2" to 24" for superheat steam up to a temperature of 500 degrees Fahrenheit of cast steel with full monel mountings, monel stems and cooling chamber to protect packing.



207

14" Cast-Steel Gate Valve for Gate Superheat Steam

Taper seat, 1000 lb. working pressure. 2000 lb. test pressure

Sizes 1½" to 12". The strongest valve possible to make in its weight, all surfaces

being cylindrical or spherical segments.



Gate valves for any pressure

Designs and quotafurnished valves for special conditions or higher pressures. Materials used 8" 1000 lb. Hydraulic Gate Valve are those best adapted to service.

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PRATT AND CADY CO., INC.

HARTFORD, CONN.

Manufacturers of Valves and Asbestos Packed Cocks

RENEWABLE SEAT GATE VALVES: Bronze and Iron

All styles for all pressures. Sizes up to 24 inches.

With renewable seat rings, held in place by separate retaining rings easily removable.

The seat rings are independent rings of bronze, or material best adapted for the service in which the valve is to be used, and they can be easily renewed when worn or scored without removing the valve from the pipe line. The gate is a double-faced wedge-shaped casting,

208

Renewable Seat Gate Valve

with side grooves by means of which it slides on guides in the valve body.

Gauges are used in machining all parts to insure their accuracy and interchangeability.

The guides in the bodies are of equal thickness, and the wedge can be taken out of the valve and replaced with the opposite faces in

contact and will give an accurate fit. The importance of this in making repairs is obvious. These valves, being double seated, can be used with the pressure applied at either end.

REGRINDING SWING CHECK VALVES:

Bronze and Iron

All styles for all pressures, sizes up to 36 inches. Sizes 3 to 12 B. Underwriters' Pattern.

The design combines pressure resistance with easy flow lines. Each valve is tested to an adequate pressure. All seats are carefully ground. Assembling

done bv is expert me-The chanics interior construction permits the replacement of any working part without removing valve from line. For re-



Regrinding Swing Check Valve

grinding no tool is necessary but a wrench, brace and bit.

ASBESTOS-PACKED COCKS:

Bronze and Iron

Made in sizes 1/8 inch to 10 inches, for all pressures.

The dovetailed, U-shaped grooves in the body are packed with prepared asbestos and afterward the entire cock is subjected to a special vulcanizing process, which makes it more serviceable and better able to withstand higher pressure and temperature. An asbestos ring is used on the shoulder of the plug for top packing.

The plug is of standard taper carefully finished and barffed to render it rust-less. It has no metallic bearing, coming in contact only with asbestos, the elasticity of which compensates for the differential expansion and contraction of the plug and body. The gland admits of adjustment by means of its bolts.

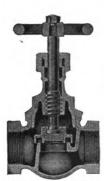
cocks These exceedingly give resatisfactory sults as boiler blow-offs and column water blow-offs, between check and between boiler. water column and boiler, and they do work where ground plug cocks, globe, angle or gate valves fail.



Asbestos-Packed Cock

PRATT AND CADY CO., INC.

BRONZE GLOBE AND ANGLE VALVES:



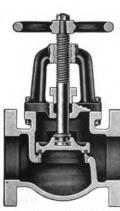
Bronze Globe Valve

Made in sizes 1/8" to 3" for 150 and 300 lbs. steam working pressures.

The 150-lb. line has an asbestos ring disc. It is softer than the valve seat and, therefore, takes the wear and preserves the seat indefinitely. The 300 lb. line has a solid bronze disc to withstand the greater pressure.

A new disc can be substituted by removing the old disc from the stem and sliding on a new one, without removing the valve from the line, thus reducing maintenance cost. The valve seat is rounded which prevents any substance from settling thereon.

IRON BODY GLOBE AND ANGLE VALVES: Made in sizes



Iron Body Globe Valve

Made in sizes 2" to 8" inclusive, for 125 lbs. and 250 lbs. steam working pressures.

The discs on the 150-lb. line are fitted with an asbestos ring vulcanized into an iron holder. The 250-lb. line has a bronze ring disc. These discs can be easily newed in the same way as the bronze globe valves.

We use the utmost care in machining and assembling these valves and can

thoroughly recommend them for exacting service.

CAST STEEL GATE VALVES: (For Superheated Steam)

Globe and Angle valves are made in sizes 2" to 8" inclusive.

Gate valves are made in sizes 2" to 16".

All valves tested to 800 lbs. hydrostatic pressure and suitable for 325 lbs. steam working pressure with a total temperature of 800° Fahr.



Cast Steel Gate Valve

The valves are trimmed with monel metal throughout, including the spindles.

These steel valves are machined with great care and accuracy and are made from patterns especially designed for the best cast steel foundry and machine shop practice, thus insuring a product with homogeneous metal and perfect workmanship.

AUTOMATIC STOP AND CHECK VALVE:

Made in semi-steel for 250 lbs. working pressure, in cast steel for 325 lbs. working

pressure and total temperature of 800° Fahr. Design is based primarily on simplicity and ruggedness with full regard to exacting requirements of the service. Piston and disc are of one piece and provide perfect alignment at the only two points where such is required. The absence of a stuffing box



Automatic Stop and Check Valve

prevents any hindrance to free movement of all reciprocating parts. No binding or sticking. Made in globe and angle patterns.

(See page 161 for additional products of this Company)

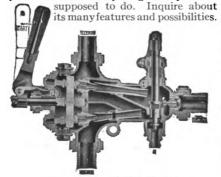
200

SCHUTTE & KOERTING CO.

1184 Thompson St., PHILA., PA.

BRANCHES: New York, Boston, Chicago, Pittsburgh, Cleveland, Denver, Kansas City, Charlotte, New Orleans

The Koerting Universal Double Tube Injector requires only one lever to operate, needs no adjustment, takes water up to 150° F., discharges into boiler near boiling point. Will do everything an Injector is



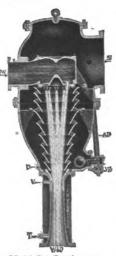
Koerting Universal Injector Over One Million in Use

210 Our Condenser and Jet Department handles apparatus for:

Lifting and Heating Liquids
Moving Air & Gases, also Injectors
Syphons Spray Nozzles
Strainers Suction Draft Systems
Exhausters Blowers

COMPLETE CONDENSING AND COOLING EQUIPMENT:

The Koerting Multi-Jet Condenser is of the low - level type built in all sizes up to 5000 KW. in single units, for larger units a twin arrangement is provided. Maintains a high vacuum without the use of an air pump, the jets serving to condense the steam and remove the air. No moving parts or stuffing boxes in vacuum chamber. Low head room.



Multi-Jet Condenser

SCHUTTE VALVES:

Stop Check (Non-Return) Emergency Stop Check Engine Stop System

Trip Throttle—Balanced

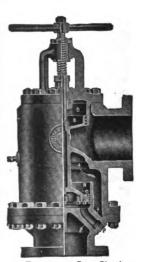
Free Exhaust Back Pressure

Butterfly Gate Hydraulic Reducing

Pump Governors Butterfly

Lead Valves

The Schutte Emergency Valve shown is of the Triple Duty Type. Valve closes automatically the instant a boiler tube or steam main bursts, prevents live steam from flowing into a cold boiler. Can be closed by hand at the valve or from a distance by operating small valve.



Emergency Stop Check Valve

INGINEERING

ASME

The Schutte Engine Stop Systems protect fly wheel explosions and over speeding of engine. Can be operated in three distinct ways, electric, either open or closed circuit, mechanically, or by steam.

The Governor is set at a predetermined speed; the instant the engine reaches this point, valve is closed, thereby stopping engine.

SEZ
OURADVISIN
MECHANICAL

Request Catalog.

SCHUTTE & KOERTING CO.

We are the largest and most widely known manufacturers of Acid Spray Nozzles.



Acid Chamber Spray Nozzle

We make them in Platinum, Stoneware, Glass, Witclay, Rubber, Brass, Iron, Steel and Lead.

Our Spray Nozzles are adapted to the absorption of gases, washing and atomizing of chemicals.

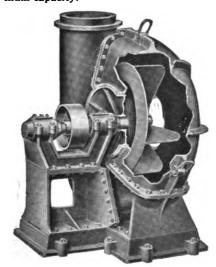
CHEMICAL PLANT EQUIPMENT:

Acid Valves
Air-Jet Lifts
Syphons—Acid
Blast Nozzles
Blowers
Sulphur Furnaces
Vapor Condensers
Dust Collectors

Lead Exhausters Pumps—Centrifugal Blow Cases, Auto. Agitators Fans—Rotary Lead Heaters—Lead

Apparatus for moving air and gases. Spray nozzles for all chemical purposes.

Our New Lead Acid Fans shown below embody modern features which reduce speed and power, and overcome vibration, giving positive suction with maximum capacity.



Rotary Lead Acid Fan

MARINE AUXILIARIES:

Evaporators
Oil Coolers
Oil Heaters
Oil Strainers

Oil Burners

Distillers
Feed Water Heaters
Evaporator Heaters
Thermofans for Heating and Ventilating

211

Apparatus for recooling oil, air and water.

Fumigating Systems for Ships

Bilge Syphons

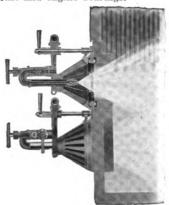
Injectors—Boiler Feeding Ship Maneuvering Valves

Throttle Valves

Reducing Valves Grease Extractor and Feed Water

Filter

The S. & K. Oil Coolers are used extensively in the steel mills and industrial plants for cooling the lubricating oils to turbine and engine bearings.



Fuel Oil Burners

THE KOERTING OIL BURNING EOUIPMENT:

Both for marine and stationary work, operates under forced or natural draft. High or low pressure air with or without steam.

All types of burners from 100 H. P. up. Also used on:

Annealing Furnaces
Glass Furnaces

Acid Concentrators

We supply complete equipment from pumps to burners.

The Koerting types of burners are the Mechanical, Universal and Gravity.

The Mechanical having high pressure preheated oil.

Universal, low pressure oil and air.

Gravity, low pressure oil or gravity feed with low pressure air or steam.

SCOTT VALVE MFG. CO.

DETROIT, MICH.

WESTERN BRANCH: Scott Valve Co., Chicago, Ill.

Manufacturer of Valves for Every Service

SCOTT BRASS AND IRON BODY GATE VALVES:



Made in three weights for standard, medium and extra heavy pressures. They are remarkable for their simplicity of construction. Designed with a special view to strength and compactness.

All fitted with our Scott Double Disc 212 Cylindrical Wedge, which makes a full circular bearing upon the back of the



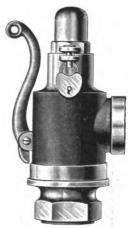
No. 171 Iron Wheel
All Bronze, Flanged with Bolted Top

disc or gate, thus insuring a perfect seating and the impossibility of the discs springing, bending or getting out of shape.

SCOTT POP SAFETY VALVES FOR SAFETY:

The most sensitive and reliable made. The adjustable screw threaded ring with angular face prevents all wear on seats. They are entirely frictionless.

Cannot cock, tilt or stick to seat. Opens precisely at the predetermined pressure, reduces the pressure quickly and closes with the smallest loss of pressure.



No. 152 Side Outlet

Blow-off pressure is adjustable to suit varying needs. Cut shows the Scott brass patent marine and stationary lock up pop safety valve, also made with iron body and phosphor bronze seats.

All our safety valves meet with A. S. M. E. Specifications.

Send for new big valve catalogue. A valuable book for your office.

YARNALL-WARING COMPANY

760-320 QUEEN ST.

CHESTNUT HILL, PHILADELPHIA

Branches and Representatives in Principal Cities

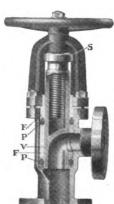
Manufacturers of YARWAY Power Plant Specialties

Yarway Power Plant Specialties are designed to promote economy and efficiency in the Power Plant.

YARWAY (Formerly the Simplex) SEATLESS BLOW-OFF VALVE:

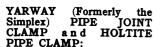
A blow-off valve unique in that it has no seat to wear down; that the packing is protected; that it will last for years without repacking or renewal.

A valve of unusual merit as proved by the inthoucreasing sands in use.



Operation

In closing valve, shoulder "S" on plunger "V" enplunger "V" en-gages the loose follower gland "F," compressing pack-ing "P" above and below the port, making an absolutely tight valve.



Quickly and easily attached, even in out-of-the-way places. Will completely stop leaks. Power, coal and money savers.



YARWAY **HYDRAULIC** VALVE (CASKEY PATENTS):

For use wherever hydraulic machinery is used. A quick acting, easily operated valve that will withstand high pressure and heavy duty.

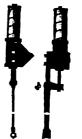
YARWAY ADJUSTABLE SPRAY-HEAD (C. C. Thomas Patents):

Adjustable to fit weather conditions.

Operated from shore by a single handle for each row.

Any clogging material can be flushed out.

Can be set to secure maximum cooling range under any conditions of temperature or humidity.



YARWAY **AUTOMATIC** SKIMMER:

BOILER

Prevents the formation of scale in the boiler by removing suspended matter in the feed water, continuously and automatically. One of the hundreds in use has been removing more than 2 tons of mud and scale matter per year from one boiler.

YARWAY STARTING AND PRES-SURE UNLOADER (Richards Patents):

A power saver for the motor driven air compressor. Simple, automatic, coolrunning and long wearing.

YARWAY-LEA V-NOTCH METER:



To measure boiler feed water, blow-off discharge, condensate, commercial liquids. A simple device to keep the boiler plant in a state of continuous test by daily records of performance.

BULLETINS AND INFORMATION:

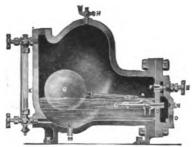
About any Yarway specialties will be sent upon request.

AMERICAN STEAM GAUGE & VALVE MANUFACTURING CO.

Established 1851

FACTORY AND GENERAL OFFICES, BOSTON, MASS.

AMERICAN IDEAL STEAM TRAP:



Model C-Sectional View

The essential feature of this trap is its valve leverage, which is many times more powerful than in any other Float Trap.

This permits the use of floats sufficiently heavy to prevent possibility of collapse, and we make positive guarantee to this effect when traps are used on pressures for which they are intended.

The features of construction of this trap, both as regards valve leverage and design of shell or casing, insure unusually low upkeep or maintenance, and absence of trouble in operation.

AMERICAN H₂O GREASE EXTRACT-ING FEED-WATER FILTER:



Grease Extracting Feed-Water Filter

Designed for the efficient removal from feed water of grease which, after slight boiling, adheres in the form of "slugs" to boiler shell and flues. This filter has a filtering surface many times greater than area of the feed-water pipes, and occupies small space.

OPERATION—Under double filtration filtering cages are covered with two layers of "Turkish toweling," which cloths are to be changed as often as conditions require. Temporary cleaning, however, may be effected by applying a reverse current of steam and drawing off the oil and grease while filter is in service. See illustration. Further particulars sent on request.

AMERICAN RELIEF VALVES: Iron Body Brass Mounted



Approved Underwriter



Standard

All Brass



For Small Pumps



For Tanks, Btc.

AMERICAN STEAM GAUGE & VALVE MANUFACTURING CO.

FACTORY AND GENERAL OFFICES, BOSTON, MASS.

SALES OFFICES: NEW YORK, CHICAGO, ATLANTA, PITTSBURGH

Manufacturers of Steam Traps, Gauges, Valves, Indicators, and Kindred Appliances for Governing, Indicating, Measuring, Recording and Controlling Steam, Water, Air, Gas, Oil, Ammonia, and All Other Pressures

AMERICAN GAUGES are the simplest in construction, yet so designed that



Bourdon Gauge

maximum efficiency with longest service is assured to the user. Gauges are too often judged or selected from superficial inspection only, with little or no attention to interior construction—the vital part. In American Gauges only the best material and workmanship will be found, as well as accuracy. This means dollars in every sense of the word to the owner in both operating and maintenance expense. We furnish gauges for every purpose, and especially invite inquiries for installations where operating conditions are unusually severe. Estimates promptly furnished.

AMERICAN RECORDING GAUGES:



Recording Gauge

The economical operation of power is safely guarded by the use of accurate,

durable Recording Gauges. American Recorders are constructed in the same reliable, workmanlike manner that is characteristic of all our products. The style of case is the same as our non-recording instruments, thus giving uniformity to gauge board installations. Highest grade clock movements are used, insuring accurate time records. Standard chart 8 inch, 24 hour. Special charts to order. Each gauge fitted with our improved fountain pen requiring filling monthly. We specialize in engine room gauge boards complete, and invite inquiry.

AMERICAN MODEL E POP SAFETY VALVE:



215

This valve is designed embodying the best features found in our experience during the thirty years of spring loaded safety valve existence. Constructed of the highest grade materials, tested under actual working conditions, simple, efficient, and of few working parts, all being easily accessible, and all adjustments made from outside valve casing. It is the best in valve construction.

This valve is also made in outside spring pattern for superheated steam. This pattern is known as Model G.

Our seventy years' record is behind our guarantee covering all goods which we manufacture.

CROSBY STEAM GAGE & VALVE CO.

EXECUTIVE OFFICES

40 CENTRAL ST., BOSTON, MASS.

STORES: Boston, 38 Central Street

NEW YORK, 100 Walker St.

CHICAGO, 180 No. Market Street

SAN FRANCISCO, 121 Second St.

LONDON, ENG., 147 Queen Victoria St.

Manufacturers of Standard Steam Appliances

STANDARD SAFETY VALVES: Stationary and Marine



Standard Valve Conforms to the A. S. M. E. Boiler Code

also

Federal and State Laws Efficient

216

Durable

Economical High Discharge Capacity

CROSBY GLOBE AND ANGLE VALVES:



Globe Valve

Made in Brass, Iron and Steel in Various Types and Sizes, Screwed and Flanged.

The Spring Seat:

A Most Important Feature Closes Tight-Remains Tight.

Seat not easily abraded.

Nickel or Monel Seats where required.

SAFETY RELIEF VALVES:

Steam, Air and Water



Relief Valve

Made of Gun Metal A Perfect Automatic Valve Strong and Efficient

As a Water Relief Valve it has an exceedingly large discharge.

JOHNSTONE IMPROVED BLOW-OFF VALVE:



Blow-Off Valve

Swing Lever Type:

Stationary

Marine

Locomotive

Heavy and Durable Construction.

Few Parts.

Maintenance Negligible.

All Parts Renewable.

(See page 310 for additional products of this Company)

J. E. LONERGAN CO.

211-215 RACE ST., PHILADELPHIA, PA.

Manufacturers of Boiler, Steam and Gas Engine Specialties



POP SAFETY VALVES:

Were first made under Lynde Patents issued in the year 1872, and have since been improved upon by our corps of capable engineers of long experience who with their combined skill have brought the LONERGAN POP SAFETY VALVE up to its present state of excellence.

Points of Superiority:

- 1. Does perfect work while in service.
- 2. Repairs practically nothing.
- 3. Has long life.
- 4. Always seats perfectly.
- 5. Great relieving capacity as it is the only valve on the market having an expansion chamber above the seat, with baffle plate over that, so as to get the benefit, as the steam lifts the valve off its seat, of both the compressed and expanded steam, which construction gives the valve a high lift.
- 6. Adjustable screw ring, very easy to regulate-used to govern number of pounds steam relieved before valve closes.
- 7. Springs of the best grade PENN-YLVANIA ANALYSIS OPEN OPEN SYLVANIA HEARTH STEEL, of a fibre stress suited for best results.
- All valves made with bevel seats. except when otherwise ordered.

"Protected Spring" Pop Safety Valve Model "B:"

For Water Tube Boilers, etc. Encased Spring, to protect it from contact with live steam. Lonergan Patent Double Eccentric Lifting Gear, the best lifting device made.

Good for working pressure up to 300

lbs.
Testing yokes furnished at small extra

Fitted for LOCK to prevent their be-Recommended for tampered with

Recommended for use in Power Stations, Electric Light Plants, Large Manufacturing Plants.
Sizes 2", 2½", 3", 3½", 4", 4½", 5" and 6", Iron Body Bronze Mounted, with either bronze or nickel agents.

or nickel seats.

"Marine" Pop Safety Valve Model "D:"

For use on Marine Boilers.

General Specifications same as Model

Handle on top al-ows valve to be lows valve to be turned on its seat when under steam pressure.

Repairs easily made as valve can be broken below outlet, for seat Complies with rules

United States Board

of Supervising Inspec-tors of Steam Vessels. Board of Trade, Great Britain.



Model "D"

British Lloyds.
British Lloyds.
Bureau of Veritas, France.
Sizes 2", 2½", 3", 3½", 4", 4½", 5" and 6",
Iron Body Bronze Mounted.

DUPLEX POP SAFETY VALVE (MODEL "F"):

Two valves in one base casting. Fur- 217 nished with outlet at either end, or in center. Made in Bronze, Steel, Semi-Steel and Iron. Equipped with Rockershaft Lifting Gear so valves can be lifted in succession or simultaneously. Used largely by U. S. Government, Merchant Marine, etc.

WATER RELIEF VALVES:

Good for working pressures up to 300 lbs. Recommended for use on Pumps, Hydraulic Elevators, Pipe Lines, Water Works, etc. Relieving capacity unequaled by any other make of valve on the market.

CHIME WHISTLES:

Made in two types, Model, "WV," adjustable Lever with valve. Model, "WN," without valve. Bell diameter sizes from 1½" to 12". Bells of solid cast bronze and not built up with a web inside of a lap-welded tube. Recom-mended for Marine and Stationary Work, Fire Alarms, etc.

We also manufacture Cylinder Relief Valves, Plain Whistles, Quick Closing Water Gauges, Automatic Closing Water Gauges, Chain Pull Gauge Cocks, Oil Cups, Grease Cups, Jelco G. G. Cutters.

(See page 311 for additional products of this Company)

A. W. CASH COMPANY

DECATUR, ILL.

Manufacturers of Pressure Reducing and Regulating Valves, Pump Governors, Fan Engine Regulators, Relief Valves, Strainers, Ammonia Expansion Valves and Oxygen-Acetylene Regulators

PRESSURE REDUCING AND REGU-LATING VALVES:

CASH STANDARD

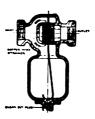


Class D—for Steam, Air, Oil, Hot Water, Cold Water, Ammonia and various other gases. Accurate, depend-218 able reduction and regulation.

All working parts quickly removable. Effective self-contained strainer. For all pressures—air service as high as 3000 lbs. Made in iron and bronze bodies. Single and double seat. In sizes ½" to 4".

All iron body valves electro-galvanized.

Valves for Superheat steam service with monel metal parts a specialty.



CASH STANDARD Strainers—for Water, Steam, Oil and various gases. Rigid construction, the above type good for 300 lbs. working pressure. Extra large sediment chamber. Standard pipe cleanout plug. Install cock, pipe to drain and blow out frequently. Iron Body—Bronze Screen, Screw End type, ½" to 2"; Flange End, 2" to 10". All electro-galvanized.



CASH STANDARD Class G Regulators with Outside Auxiliary Control for both Power and Heating Service, for both high and low pressure water or steam, where initial pressure is constant or variable, or where there are large variations in volume or delivery pressure.

Stock valves regulate very close and accurately. Special valves of this type can be made to control within one inch water column. Iron Bodies, Standard and Extra Heavy. Sizes 2" to 10".



CASH STANDARD Pump Governors very sensitive. Control by variation in discharge pressure from pump. No leakage. No wearing of grooves in cylinder by cup packing. Effective self-contained strainer. All parts quickly removable. Iron and bronze bodies. Sizes 3%" to 3".

Write for latest catalog showing complete line. It contains valuable information that will interest you and prove useful.

THE FISHER GOVERNOR COMPANY

MARSHALLTOWN, IOWA

Manufacturer of Pump Governors, Reducing Valves, Back Pressure and Exhaust Relief Valves, Balanced Lever and Float Valves, Boiler Compound Feeders, Air Traps, Steam Traps, Oil Field Specialties

FISHER STEAM SPECIALTIES are the products of untiring research, the use of best materials for the purpose and conscientious, careful workmanship. The finish of Fisher products is carried beyond the "good enough" stage not only because a high finish makes an attractive appearance, but because it makes the apparatus more sensitive. When two or more metals are suited to the requirements, but one is a trifle better than the others, we choose the best. That is the policy in all Fisher

The United States Government speci-fies "Fisher or equal." Our products reflect our pride in that confidence.

FISHER PUMP GOVERNOR:

There is a Fisher for every service, pressure and vacuum, power plant and marine, in several types. They are made screwed or flanged, angle or globe; made in sizes from 1/4" to 12". each type varying in its range of size to meet the required service.

No matter what your pump handles-plain water, brine, ammonia, acid or alkali-we can supply a Fisher governor.

FISHER REDUCING VALVES:

For a very sensitive, quick acting, reducing valve for either steam air, water, gas or oil service specify "Fisher."

They will not stick, chatter or hammer; made in several types and sizes ranging from 1/4" to 24".

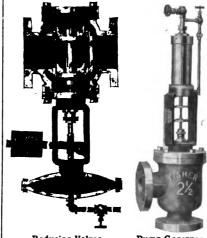
EXHAUST RELIEF VALVE:

For condensing service you need a Fisher exhaust relief valve to protect your engine or turbine. They are positive in action—operate without noise. They automatically open if the vacuum is lost, permitting engine to exhaust to atmosphere. When the vacuum is restored they automatically close; made in horizontal and vertical types—sizes 6" to 36".

FISHER STEAM TRAP-TYPE 33:

If you need a steam trap, you need a Fisher trap. Their action is positive; constructed of the best materials with only two wearing parts, valve and seat, made of Monel Metal-practically incorrodible. Bucket is a gray iron casting whose walls are but as thick as cardboard, as light as pressed steel, but will outlast several steel buckets. The trap will not blow steam; it is water sealed. Made in sizes of 1/2" to 3" to discharge 1000 to 14,000 lbs. of water per hour.

Send for bulletins and catalogues.

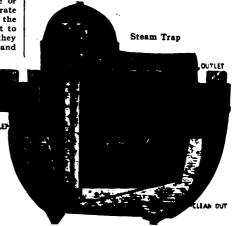


Reducing Valves

Pump Governor



Exhaust Relief Valve



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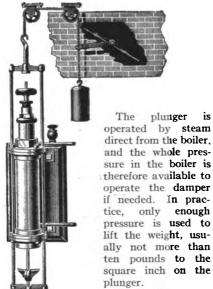
219

JULIAN D'ESTE COMPANY

26 CANAL ST., BOSTON, MASS.

Brass Founders, Finishers and Machinists Sole Manufacturers of Curtis Engineering Specialties

THE CURTIS IMPROVED DAMPER REGULATOR:



Damper Regulator

220

The motion of the damper will begin to change from one di-

rection to the other on a minimum variation of steam pressure.

We guarantee a saving of ten per cent of the fuel over the best hand regulation, and it often reaches fifteen per cent.

They are sent on thirty days' approval and will pay their cost by the saving of suel in one year. Three standard sizes, 1, 2 and 3.

IMPROVED STEAM PRESSURE REGULATORS:

This regulator is made entirely of metal; occupies the same space as a globe valve for the same size pipe; is a lock valve and is very simple and sensitive. Each size is made to a standard gauge; any injured piece can be replaced at a moment's notice.

For universal applications to all the varied and various conditions under which a reduced pressure of steam is required, this regulator has no equal. It is compact and self-contained, without levers, weights or projections.

This regulator is suitable for boiler pressure up to 250 pounds and will deliver accurately and uniformly any lower pressure from one to within a few pounds of the initial pressure.

In the best engineering practice the exhaust steam of the engine and elevator is turned into the heating system of a building, and the regulator automatically supplies just the amount lacking to maintain constant pressure in the pipes and radiators.

It has no glands or packing; no drip or leak of steam or water. All that passes into it passes through it without waste or loss.

It is used on steam heating apparatus, slashers, jacket kettles, air and water pumps; on steamships for deck machinery, pumps supplying steam to engines at lower than boiler pressure, or in any place where it is desired to reduce from a high pressure to a lower pressure. In pulp and paper mills, on digestors and on the dryers, it is highly recommended and can be used in connection with exhaust steam, and we can guarantee perfect work and scientific drying of all grades of materials.



Steam Pressure Regulator

Standard sizes for $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1", 1 $\frac{1}{4}$ ", 1 $\frac{1}{2}$ " screwed-all bronze; 2" screwed, cast iron body, bronze mountings; 2 $\frac{1}{2}$ ", 3", 4", 5", 6", 7", 8", 10" and 12" cast iron body, bronze mountings, extra heavy standard flanges.

A lockup top furnished at small additional cost.

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JULIAN D'ESTE COMPANY

26 CANAL ST., BOSTON, MASS.

Manufacturers of Damper Regulators, Hydraulic Damper Regulators, Improved Pressure Regulators, Improved Pump Regulators, Water Pressure Regulators, Expansion Trap, Return Steam Trap, Balanced Steam Trap, Balanced Valves, Relief Valve for Steam and Water, Steam Separator, Temperature Regulator, Pump Governor and Pump, Blower Valve, U. S. Ball Cock, Etc.

CURTIS WATER PRESSURE REGULATOR:

For Pulp and Paper Mills, Hotels, Public Buildings and Dwelling Houses.

REGULATOR IS WAR-RANTED to maintain the pressure desired, with perfect uniformity, regard-

Curtis Water Pressure Regulator

less of any and all fluctuations in the outside pressure.

Every part of regulator which comes in contact with the (except water the diaphragm) is made of the best composition, so that trouble rust or with clogging with sediment is entirely avoided. material The workmanand ship cannot be excelled, our aim being to produce a machine

unapproachable in point of excellence, and practically imperishable in all its working parts, at the lowest price consistent with such quality and excellence.

This regulator is guaranteed to deliver water into service pipes at any desired pressure, and, however the outside pressure may fluctuate, will deliver uniformly and permanently at the point at which it is set.

Pressure reduced to the point found to be sufficient for domestic purposes prevents flying and spattering, and consequent waste of water; obviates the wear and tear by water-hammer or concussion in pipes, and thereby greatly reduces the cost of keeping the plumbing in order.

Made for 34", 1", 114", 112", 2" and

2½" pipe, screwed. Made for 3", 4", 5", 6", 7" and 8" pipe, flanged.

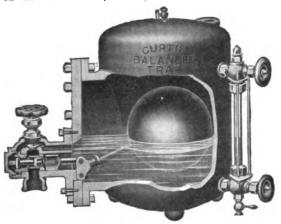
THE CURTIS BALANCED STEAM TRAP:

Some Points of Superiority

- A perfectly balanced valve.
 An absolutely frictionless valve.
 The valve can be removed without breaking a joint, starting a gasket, or
- taking out a bolt.
 4. The valve being frictionless and balanced, the whole power of the float is available for opening and closing it.
- 5. The copper float is perfectly spherical, as hermetically sealed as a glass globe, is of uniform thickness and warranted strong and tight at 250 lbs. pressure.
- 6. It has a by-pass valve to insure constant operation.
- 7. Each trap will operate perfectly on 221 pressures varying from one to 250 pounds.

PRICE LIST
Size and Condensing Capacity in Feet of One-Inch

Pipe										
No.	000,	for	1,000	ft.	1/2	in.	inlet	and	outlet	
No.	00,		2,000							
No.	0,		3,000							
No.	1.	for	5,000	ſt.	3/4	in.	inlet	and	outlet	
No.	2.	for	8,000	ſt.	1	in.	inlet	and	outlet	
No.	21/2.	for	15,000	ft.	11/4	in.	inlet	and	outlet	
No.	3,	for	30,000	ſt.	11/2	in.	inlet	and	outlet	
No.	4.	for	40,000	ſt.	2	in.	inlet	and	outlet	
No.	5.	for	60,000	ft.	3	in.	inlet	and	outlet	
No.	6.	for	95,000	ft.	4	in.	inlet	and	outlet	



Balanced Steam Trap

THE FULTON COMPANY

KNOXVILLE, TENNESSEE

NEW YORK OFFICE 610 Longacre Bldg. 1476 Broadway

DETROIT OFFICE 303 PALMER BLDG. 70 WASHINGTON BLVD.

Manufacturers of Sylphon Packless Valves, Sylphon Tank Regulators, Sylphon Reducing Valves, Regitherms, Packless Graduated Valves, Ja-Nar and Other Specialties

Sylphon specialties embody the wonderful invention shown here, having accordian-like sides made of special alloy, steam metal of uniform thickness and so corrugated as to evenly distribute the strain

over the wide area at all points. These sides are formed of deep folds which permit ample, yet very sensitive expansion. The sides are not built up of separate discs, but in each Sylphon specialty the accordian-like Sylphon is made from one single piece of metal. Sylphon specialties contain no rubber diaphragms, no pistons, or other mechanical parts to get out of order.

SYLPHON PACKLESS RADIATOR VALVE:

222



The GIBRALTAR of radiator valves—the only valve on the market that is tight against air, water and steam. The valve is packless—no camouflage—but packless—has no packing or springs to wear. The stem rises within the sylphon, thus preventing the water or steam

from coming in contact with the movable parts. The valve is fully approved by the Government and will save its cost in a short time. For steam up to 25 lbs. and water up to 50 lbs. pressure.

Ask for Bulletin MP-6.

THE JA-NAR:



The Ja-Nar is an insulated, cabinet-like radiator cover containing a complete automatic, heat controlling mechanism. It is made of furniture steel, finished in baked enamel to imitate woods of different kinds and can be placed over any radiator that stands upon the floor. Its purpose is to conceal the radiator with a handsome cabinet to match the furniture, or trim, to maintain a uniform room temperature, and to protect walls and draperies. The Ja-Nar requires no supplementary devices, pumps or connections. It can be used in rooms where temperature regulation is desired without affecting any other part of the heating system. It is noiseless in operation. A beautiful catalog will be sent upon request.

Ask for Bulletin "Ja-Nar."

SYLPHON REGITHERM:

An automatic temperature regulator which responds to the slightest change in temperature of air and is used to control valves.



control valves, dampers and shutters. It requires no electricity or compressed air and has no clock-work or diaphragms. The power is contained within the instrument and never loses its effectiveness. Requires no attention—simply set it and let it alone. Desirable for residences or industrial and office use.

Ask for Bulletin MR-101.

SYLPHON WATER REGULATOR:



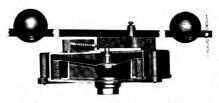
Used to control the dampers on hot water heating boilers and are simple, accurate regulators, which will control the draft so as to maintain a constant temperature of the water at any point between 120° and 220° F. These regulators prevent

temperature of water from rising higher than necessary, insuring faucet water of even temperature every hour of the day.

Ask for Bulletin MD-101.

THE FULTON COMPANY

NO. 925 VAPOR DAMPER REGULA-TOR:



Extremely powerful and sensitive. It will control at pressures as low as 2 oz. any dampers found on the average boiler. The extra flexible Sylphon is 12" in diameter, giving 100 square inches effective area, and is fitted with a compensating device which overcomes friction in the moving parts and prevents the regulator from fluttering. The regulator is made entirely of metal and has no perishable rubber diaphragms. The Sylphon expansible member is made in one piece, not built up of separate discs, thus eliminating leaky joints.

Ask for Bulletin MD-101.

NO. 933 TANK REGULATOR:

This is a new instrument, embodying features heretofore unobtainable and is built to meet a special demand. It is of the direct connected type and is applicable where the steam pressure does not exceed 25 lbs. The valve is Government type, Sylphon packless, single-seated, and absolutely tight against air, water and steam. The valve has no packing or springs to wear out; the stem through an opening which never requires packing, being enclosed within the valve body by a rugged, dependable Sylphon, eliminating friction around the stem.

Ask for Bulletin MT-101.



SYLPHON TEMPERATURE REGULATOR NO. 930:



This regulator used to automatically and accurately regulate the temperature of liquids has the lever and weight method of adjustment, which is the most accurate type yet produced. It can be furnished to either open or close the valve on advancing temperatures. The valve is

of the highest grade, bevel-seated balanced type and furnished in sizes of from ½" to 5". The extreme sensitiveness, positive action and simplicity of this regulator have placed it in a class by itself.

Ask for Bulletin MT-101.

SYLPHON TEMPERATURE REGULATOR NO. 931:

In this regulator, used for the same purpose as No. 930, the spring method of adjustment is employed. Like the No. 930 this instrument can be furnished to either open or close the valve on advancing temperatures, and the valve is of the highest grade bevel-seated balanced type. It is regularly finished in sizes from ½" to 2½", inclusive, with 8' of flexible tubing. No auxiliary valves, compressed air, elec-



tricity, pistons or diaphragms are used.

Ask for Bulletin MT-101.

CATALOG AND PRICE LISTS:

Catalogs and bulletins will be sent to any one upon request. If you are interested in any particular device shown on this page, send for the bulletin applying to instrument.

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IDEAL AUTOMATIC GOVERNOR CO.

Incorporated

164 EMMET ST., NEWARK, N. J.

Manufacturers of Pump Governors, Pressure Regulating and Controlling Valves and Ideal Automatic Piston and Valve Rod Packing

"IDEAL" AUTOMATIC GOVERNORS

oil-controlled piston - actuated, pressure - controlling valves for governing pumps for and fresh water. amoil, monia, air, gas, etc. They are extremely sensitive, with the patented exclusive feature of an oil body in the hydraulic pressure cylinder, against the lower head of the hydraulic-pressure-actuated piston which operates the valve in the power 224 line to the pump. This body of oil prevents the liquid being pum ped from reaching the hy-Oil draulic pres-Cylinder sure cylinder, and thus prevents any sticking of the pis-Oil ton from corrosion Trap or on account of

grit or sediment in Style "A" the liquid being pumped. An oil trap provides for settling of foreign matter, etc., and for retaining a sufficient body of oil in the cylinder to constantly bathe the cylinder walls, piston, and packing in lubricant. The material used in constructing governors for high duty service is Navy composition bronze or steel; for less exacting service steam composition or cast iron.

"Ideal" Automatic Governors are constructed either to maintain a constant pressure (Style A) or to permit of variation of the pressure maintained as desired (Styles B, B-1, B-2) and are used for controlling automatic fire sprinkling system pumps, elevator pumps, turbine

step-bearing pumps, hydraulic pumps, ammonia, gas and air compressors, and any other apparatus requiring sensitive, reliable automatic pressure control of steam, water or pneumatic power. They have been approved and adopted by the United States Navy and by the National Board of Supervising Inspectors of Steam Vessels for controlling salt water fire pumps, salt water sanitary pumps, bulkhead collision door pumps, fresh water pumps, clutch pumps, hydraulic pumps, ash pumps, forced feed lubricating pumps, ammonia and air compressors, etc.

Special adaptations of the "Ideal" Automatic Governor have been made for a variety of purposes, including a stop valve for cutting off flow from pump when pressure falls or vacuum is broken, by a break in delivery or suction line (Style C-S); a high pressure by-pass relief valve taking pressure from accumulator side and by-passing when full travel of accumulator is reached or by-passing to atmosphere when electrically pumped liquids exceed maximum desired pressure (Style A-R); a double-safety, combining the principles of Styles A and C-S, providing automatic pressure control, and stopping pump if accident causes the pressure to fall below a fixed minimum (Style A-C-S); and many others.



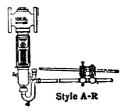




Style A-C-S

Style C-S

Style B-I A



Write for descriptive bulletins, showing all styles, and supply data regarding desired sizes, pressure to be controlled, purpose, etc., for prices.

KIELEY AND MUELLER, INC.

34 West 13th St., NEW YORK CITY

Manufacturers of a Complete Line of High Grade Steam, Water and Air Specialties for Modern Heating, Power and Plumbing Installations

KIELEY SPECIAL '98 REDUCING We los. s. 75 lb Wi excee Pum and de libs. addit

SERVICE—The independent diaphragm feature of the Special '98 Valves make them very desirable for use in connection with vacuum or vapor heating systems, or any other service where close regulation is of importance. They are not, however, suitable for reducing pressures against a dead end. For such service use our Single Seated Reducing Valves.

REGULATION—The Special '98 Regulating Valves, both straight and differential patterns, are especially designed to meet the most exacting requirements in promptly responding to the slightest fluctuation in the reduced pressure.

Should a given pressure be desired at any point of the heating system or supply mains it can be had and maintained within a fraction of a pound of what is required, by adjusting the weight on the lever and by extending the ½" pipe, which connects to the bottom of the diaphragm, to the point at which the pressure is desired.

WORKING PRESSURES:

Standard Weight—Initial pressure 125 lbs. or less. Delivery or reduced pressure 0 to 10 lbs. Extra Heavy—Initial pressure 150 lbs. or less. Delivery or reduced pressure 0 to 10 lbs.

KIELEY POSITIVE ACTING PUMP GOVERNOR:

Service—For automatically controlling speed of pumps and maintaining water lines in heating systems, receiving tanks, feed water heaters, etc.

This device can be placed at any height above the pump suction and, when properly connected, will automatically control water lines or the speed of condensation or boiler feed pumps or both.

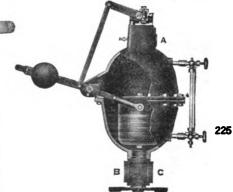
The cast iron floats are indestructible, and all moving parts, with the exception of the floats, are on the outside, where they can be reached readily for adjustment and repairs. Bodies are cast iron and steam valves are constructed of Government Bronze.

"A"—Inlet or equalizing pipe. "B" and "C"—Inlet or suction.

WORKING PRESSURES—Suitable for 150 lbs. steam pressure from boiler to pump, and for 75 lbs. pressure on the returns.

Where the steam pressure from boiler to pump exceeds 150 lbs., we supply a steam valve for Pump Governor fitted with monel metal seats and discs at a slight additional cost.

Where the pressure on the returns exceeds 75 lbs., we furnish our Extra Heavy pattern at additional cost.



No. 334

OTHER PRODUCTS:

Reducing Valves for steam, water, air, etc. Back Pressure Valves for all purposes. Atmospheric Relief Valves for all purposes. Steam Traps for all purposes. Damper Regulators of various kinds. Hot Water Temperature Controllers. Steam and Water Separators.
Oil and Grease Extractors. Pump Regulators. Water Pressure Regulators. Water Pressure Regulators. Water Pressure Regulators. Grease and Oil Traps. Feed Water Regulators. Grease and Oil Traps. Emergency Valves. High and Low Water Alarms. Strainer Connections of various kinds. Drip Tank Controllers. Float Valves. Tank Pump Controllers. Pump Governors and Receivers. Combination Muffler and Grease Extractor Tank, Receiver, Pump Governor, Pump and Feed Water Heater. Grease Extractor and Purifier.

NOTICE—Trade Mark "KIELEY" appears on all our specialties, and they are known by that name. Kindly order or specify accordingly.

NEW COMPLETE CATALOGUE SENT ON REQUEST.

ILLINOIS ENGINEERING COMPANY

GENERAL OFFICE AND FACTORY: CHICAGO

Steam Heating Systems, Automatic Steam Power Specialties

Branches and Representatives

CANADIAN OFFICE: TORONTO, 111 KING STREET, EAST

BALTIMORE, Builders' Exchange BOSTON, 141 Milk Street BUFFALO, 756 Washington Street CLEVELAND, 412 Century Bldg. DENVER, 420 Century Bldg. DALLAS, 207 Gaston Bldg. DATROIT, 1919 FOOT Bldg. HARRISBURG, 214 North Third St. INDIANAPOLIS, 1224 State Life Bldg. KANSAS CITY, 410 E. 43rd St. Los Angeles, 1101 Baker-Detwiler Bldg.
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ROCHBSTER, 404 Cox Bldg.
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San Francisco, 559 Pacific Bldg.

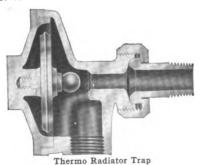
ILLINOIS STEAM HEATING SYSTEMS:

VACUUM-VAPOR-MODULATING

Illinois Heating Systems are the highest development of modern heating, and are the result of over two decades of specialized work in the heating field.

Illinois Systems are successfully installed in thousands of buildings from 226 Coast to Coast.

We manufacture a full line of Vacuum and Vapor Specialties, and all necessary accessories, such as Vacuum Pump Governors, Suction Strainers, Air Liberating Tanks, Vent Seal Valves, Expansion Joints, etc., also Steam Specialties, and maintain an efficient Engineering Department to assist Architects and Engineers in the proper installation of our devices.



All Illinois Systems, whether Vacuum or Vapor, use our Thermo Trap on all

radiators. This Trap has many exclusive advantages as will be seen in cut of same. It is the original Vertical Seat Trap, thus avoiding trouble from stoppage by dirt.

The diaphragm is carefully made of 90,000 lbs. tensile strength Phosphor Bronze and the durability of these is such that, under our three-year guarantee, the number of renewals is practically nil.

The Thermo Trap is sensitive and positive in operation. It is made in four sizes with a range in capacities from 50 sq. ft. to 1500 sq. ft. of radiation.



Supply Valve

The Illinois Modulating Supply Valve controls supply of steam to the radiator by only a half turn of the handle from closed position to full open. This gives ready and easy control of the temperature of the room.

Write for Bulletin No. 10 for detail data concerning these specialties.

Write for 88 page Catalog descriptive of Illinois Heating Systems.

ILLINOIS ENGINEERING COMPANY

GENERAL OFFICE AND FACTORY: CHICAGO

Manufacturers of Automatic Steam Power Specialties, Pressure Reducing Valves, Back Pressure Valves, Atmospheric Relief Valves, Non-Return Stop and Check Valves, Steam Traps, Oil and Steam Separators, all types, Cast Iron Exhaust Heads, Balanced Valves, Pump Governors, Etc.

Eclipse

We manufacture the **Eclipse Steam Specialties** established by John Davis
Co. Many of these devices have been on the market for 35 years, and many of the standard steam specialties in general use found their origin in the pioneer Eclipse line.

PRESSURE REDUCING VALVES:

For all pressures and services, the cumulative experience of 35 years has perfected these valves.



Vacuum Type Reducing Valve

The Eclipse Vacuum Type Reducing Valve will regulate and hold the reduced pressure within a 4 oz. limit. Will reduce from an initial pressure as high as 150 lbs. to any reduced pressure from 10 lbs. to 1/4 lb. This valve is ideal for use in Vacuum Heating Systems, where a con-

stant low pressure is desired, and it is used on thousands of important buildings.

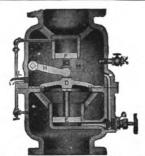
The Eclipse Adjustable Piston automatically compensates for variations in pressure insuring tight closing, and is exclusive to Eclipse Valves.

BACK PRESSURE VALVES:

Of all types.

Combination Atmospheric Relief and Back Pressure Valves (see cut) for plants operating both condensing and non-condensing, or wherever precise regulation of back pressure is desired. Built under Hockfeldt Patents.

Atmospheric Relief Valves for safe-guarding engines and turbines run condensing.



Combination Atmospheric Relief and Back Pressure Valve

Balanced, Bevel-seated Valves, both spring controlled or lever and weight controlled.

NON-RETURN VALVES:

Eclipse Stop and Check Valves have several exclusive points of merit. They are of heavy construction for 250 lbs. working pressure, the large internal dash pot is independent of the body, the piston is reinforced with 4 ribs -not a plain rod as usual, and the valve Non-Return Valve



can be packed while in They do not stick service under pressure. or chatter. Also built with steel bodies and monel parts for Superheated Steam.

Write for Bulletins covering the above valves and other Eclipse Steam Specialties.

Pressure Regulating Valves, Bulletin 101 Back Pressure Valves, Bulletin 201 Steam Traps, Bulletin 301 Non-Return Valves, Bulletin 451 tra Heavy Bulletin 451 Globe and Angle Valves. Steam and Oil Separators, Bulletin 501 Pump Governors, Boiler Trimmings, Bulletin 701

Representatives in 21 principal cities.



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THE LESLIE COMPANY

FOUNDERS AND MANUFACTURERS

LYNDHURST, N. J.

PACIFIC COAST AGENTS: CHAS. C. MOORE & Co., ENGINEERS, SAN FRANCISCO, CAL.

LESLIE Pressure Regulators or Reducing Valves for Steam or Air

LESLIE PRESSURE REGULATORS: Class "E"

For Marine and Stationary Service; suitable for Superheated Steam.

Class "F"

For General Service in Saturated Steam. Class "H"

For Steam Heat and Other Low Pressure Stationary Services.

ALL LESLIE Pressure Regulators, when adjusted, work AUTOMATICALLY.

Class "E"

Made of High Pressure Steam Bronze throughout, in standard sizes from ½ to 20 inches, inclusive, is especially designed to deliver any desired pressure from a minimum of about 10 lbs. to a maximum of 85% of the initial or boiler pressure and to operate under any working steam pressure up to 350 lbs., in all kinds of service, both Marine and Stationary, for Steam (saturated or superheated), Compressed Air and Oil under pressure to Burners, Journal Bearings, etc.

Our Class "E" Regulators have met the most exacting and searching tests demanded by the United States and Foreign Navies, up to 350 lbs. working steam pressure. In service, where all other makes had failed, they have proved so successful that they are specified by the leading Naval Architects, Marine Engineers and Mechanical Engineers, as well as the largest users of Reducing Valves in the world, who not only specify them, but insist upon "Leslie" Valves being installed.

Class "F"

Has Main Body, Top and Bottom Caps of special high grade iron, with high pressure steam bronze fittings throughout, is made in standard sizes



from 4 to 20 inches, inclusive, will deliver any desired pressure from a minimum of about 10 lbs. to a maximum of 85% of the initial or boiler pressure, and is suitable for any working steam pressure up to 225 lbs. in saturated steam service.

The Class "F" Regulator meets the growing demand for a reliable Reducing Valve at reduced cost, where superheated steam is not used. This type of Regulator can be found in the largest and most important Power and Steam Plants, Mills, Manufacturing and Mining Plants in this and foreign countries and nothing could be more satisfactory than the results obtained.

Class "H"

In standard sizes from 34" to 5", inclusive, made of highest grade steam bronze throughout; from 6" to 10", inclusive, has Main Body, Top and Bottom Caps of special high grade iron, with bronze fittings throughout; the Class "H" Regulator will deliver a reduced pressure of from about 5 lbs. to 20 lbs. and is designed for Steam Heat in buildings and other low pressure stationary services.

All LESLIE Pressure Regulators are made only of highest grade materials, and are manufactured exclusively by The Leslie Company.

THE DOLE VALVE CO.

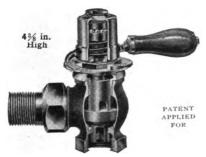
1923-1933 CARROLL AVE., CHICAGO, ILL.

Manufacturers of Packless Radiator Valves & Double Compression Couplings

DOLE PACKLESS GRADUATED VALVE:

The Ideal Valve for Vacuum or Vapor Steam Heating

The Dole Graduated or Modulating Valve is as carefully built as a watch—and as easily understood. Placed at



Dole Graduated Valve (Sectional View)

the top of the radiator—where it is easily accessible without stooping—any degree of heat can be obtained with less than a half turn of the handle. Besides being the best-looking modulating valve, the Dole is the best constructed. Its packless feature—which has proved its utter practicability in over 250,000 installations—guarantees against leakage.

A short study of the sectional view shown will prove that in designing the Dole Packless Graduated Valve we have mastered all requirements necessary to make a perfect working Graduated or Modulating Valve.

Highly Finished:

The Dole Modulating Valve is heavily nickeled and will retain its bright, handsome appearance indefinitely. Its exceptionally low height prevents it from protruding above the radiator.

Packless:

A feature which has made the Dole a permanently leakless valve. Overcomes the "packing-in-the-stuffing-box" method of construction which has caused endless trouble and damage by its leakiness.

Durably Constructed:

The Dole Valve is designed for practically everlasting service. The casting is of the best steam bronze—every detail carefully machined. The handle is made of selected mahogany.

Ball-Bearing:

An exclusive feature. No matter how long the valve has been unused it can never stick or bind. When closed it shuts off absolutely tight.

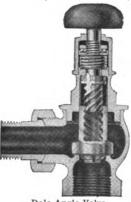
Should any adjustment be desired after the valve is fitted and installed, all that is necessary is simply to loosen octagon nut on top of dial with special wrench, which is furnished for the purpose, turn dial to left to the desired point, then tighten nut. This adjustment is easily made while the steam is on.

Made in $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1", $\frac{1}{4}$ ", $\frac{1}{2}$ " and 2" sizes.

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DOLE PACKLESS RADIATOR VALVES:

Dole Packless Radiator Valves are made in Angle, Right-Hand Corner, Left-Hand Corner, Straight-way Globe, and Straight-way Gate Styles.



Dole Angle Valve (Sectional View)

The sectional cut shown illustrates clearly the quick-opening feature, the double spiral thread. the onepiece rotating stem of properly proportioned size, and the manner in which the

stuffing box of the ordinary valve has been eliminated.

Specify Dole Packless Radiator Valves. They are fully guaranteed.

Send for our Catalogue.

MASON REGULATOR CO.

BOSTON, MASS.

Manufacturers of Regulating Appliances

REDUCING VALVES:

Reduce and maintain an even pressure of steam or air regardless of the variation of the initial pressure or of the volume of steam or air required. Automatically reduce boiler pressure for steam heating systems of all types (vacuum systems

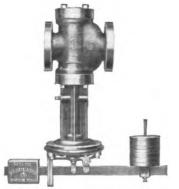


Standard Reducing Valve

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included), central heating plants, engines, paper machines, slashers, dye kettles and all situations where it is desirable to use a lower pressure than that on the boiler.

Furnished in the auxiliary operated, lever and weight, and other types. All-bronze for initial pressures of 300 lbs., and iron body for pressures up to 180 lbs.



Reducing Valve, Lever Style

STEAM PUMP PRESSURE REGULATORS:

Designed for fire, boiler feed, air and water works pumps, or any class of pumping machinery where it is necessary to maintain constant pressure. They are placed in the steam supply pipe to the pump, and connected by a 1/4-in. pipe to the discharge system thereby exactly regulating the amount of steam to the requirements of the pump, and automatically maintaining a uniform dis-



Steam Pump Pressure Regulator

charge pressure regardless of any variation of steam pressure or demand on the pump.

The key style regulator is provided with a dashpot, which positively prevents it from chattering or pounding when sudden changes occur in the discharge pressure. It is fitted with union connections threaded for standard wrought iron pipe. As regularly furnished, it is suitable for steam pressures up to 250 lbs. and discharge pressures between 20 and 140 lbs.

No. 126 regulator has been designed for closed systems, such as are used in supplying domestic service or larger pressure systems for office and factory buildings up to 150 lbs.



No. 126 Regulator

MASON REGULATOR CO.

STEAM VACUUM PUMP REGULA-TOR:

Designed to control steam operated vacuum pumps so as to maintain a uniform vacuum on the system. They are particularly adapted to vacuum systems heating of steam where steady vacuum is required and an automatic Steam Vacuum Pump

sirable. The regulator consists of a balanced type of double seated valve connected to a diaphragm operating against the action of the weights, thereby regulating the steam supply to the pumps. Suitable for steam pressures up to 180 lbs. and adjustable for any desired vacuum.

pump control is de-



Sizes, 1/2 in. to 6 ins.

For use on steam or air lines to prevent sediment, scale, bits of packing or other foreign material passing into the reducing valve or other pressure regulator installed on the line, assuring the user of continuous service. Constructed not to reduce the volume of steam or air passing through them, yet are compact and selfcleaning without removing them from the line,

BALANCED AND FLOAT VALVES:

Used to control pumps, engines and the like, by means of tank floats or cords to distant points and also in connection with various devices for the control of water to receivers, open heaters and other



All-Bronze, with Yoke and Lever

similar devices. They are made in both the double seated or disk and piston type, with weight and lever or float attachment. Regularly furnished extra heavy, suitable for pressures up to 200 lbs.

HYDRAULIC DAMPER REGULATOR:

The design of the compensating device, which The design of the compensating device, which is positive in its action, insures the closest possible regulation. The operating cylinder as well as all parts coming in contact with the water are made from high pressure bronze and carefully machined to obtain the greatest durability and sensitive. to obtain the greatest durability and sensitive action of the apparatus. The knife edges and fulcrum points of the lever are also of special construction.



Regulator

THE POWERS REGULATOR CO.

Specialists in Automatic Heat Control

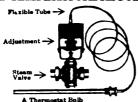
972 ARCHITECTS BLDG., NEW YORK

2732 Greenview Ave. CHICAGO

383 The Federal St. Bldg. BOSTON

The Canadian Powers Regulator Co., Ltd., Toronto, Ont.

LIQUID TEMPERATURE REGULATOR:

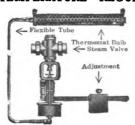


The Powers No. 11 Regulator

For the control of liquid temperatures water cooling, water heating, steam cookers, pasteurizers, and baths, hot water tanks, cooling water tanks, feed water heaters, glue heaters, etc. All metal construction. Entirely automatic and self-contained. Ask for Bulletin 129.

AIR TEMPERATURE REGULATOR:

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The Powers No. 15 Regulator

For control of air temperatures. therme tatic bulb is so constructed that it may be placed at any point in the room to be controlled, and connected with the steam valve by a flexible tube, of any required length. It is very sensitive and reliable. Self-contained, and entirely automatic.

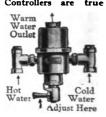
OPEN VAT REGULATOR:

The No. 16 is particularly effective for control of liquids in open tanks, cooking vats. hog scalders, scraptripe washers, etc. Self-contained. Automatic. Reliable. Ask for Bulletin 139.



HOT AND COLD WATER MIXER:

The Powers Water Controllers are true automatic thermostatic mixers, not to be compared with mechanical mixers, antiscald valves, etc. They are built in several sizes for bath rooms, showers (singly, or in gangs), water line control, etc. Another type provides for a wider range of control, especially adapted to certain industrial processes. Ask for Bulle-tin 124.



Mixer

INSTANTANEOUS WATER HEATER:



The Powers Steam and Water Mixer

The Steam and Water Mixer is an instantaneous water heater, thermostatically controlled, making it absolutely safe against scalding.

Mixes live steam and cold water. Adapted to wash sinks, shower baths, etc, in industrial plants. The most economical installation for supplying hot water. Ask for Bulletin 137.

PRESSURE REGULATOR:

The Powers all-metal construction is here applied to pressure reducing valves, for steam, air, and water. Simple, durable, accurate, reliable. Effective regardless of varying initial pressures. Used with success on sterilizers, vulcanizers, cooking retorts, etc., etc.



The Powers Pres sure Reducing Valve

Ask for Bulletin 118.

THE POWERS REGULATOR CO.

DIAPHRAGM MOTOR VALVE:



The Powers All Metal Valve

The All Metal Valve is designed for thermostatic and pneumatic control of fluids. Adapted to a great variety of industrial processes. Is called the "Lastforever" Valve, because it is extremely elastic, and durable almost without limit. Recommended especially for the critical conditions where the rubber diaphragm proves un-satisfactory.

WIDE RANGE REGULATOR:

This regulator is adjustable over an unusually wide range of temperature and finds an extensive use in the industrial field where ex-



ceedingly ac- The Powers No. 14 B Regulator curate control of heating and cooling medium is required.

It utilizes compressed air as a motive power. Is absolutely reliable, and sensitive to a fraction of a degree.

Used for cold storage rooms, dry kilns, japanning ovens, varnish rooms, pas-teurizers, air washers, leather dryers, etc. Bulletin 132.

CONDENSATION CONTROL:

A small and extremely efficient trap for apparatus using high pressure steam for heating sterilizers, vulcanizers, dryers, enameling ovens, steam kettles, steam tables, etc., etc. The Powers High Pres-



sure Steam Trap

Absolutely positive in operation, discharging freely a large volume of water, but closing tight against steam above the stipulated pressure. Ask for Bulletin 115.

INDUSTRIAL THERMOMETERS:

The Powers Thermometer is a reliable. readable thermometer at a reasonable price. It may be used to indicate air or liquid temperature at a distance of many feet if desired. White dial 41/2 inches in diameter with large readable figures in black. The Powers Exten-Is valuable where sion Bulb Therpoor light or inac-



cessibility makes the ordinary thermometer hard to read. Furnished with either rigid or flexible extension bulb.

ROOM TEMPERATURE CONTROL:







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The Powers All Metal Radiator Valve Thermostat

Industrial establishments are fast awakening to the fact that automatic control of temperature in offices and shops is a necessity if production is to be maintained at the maximum. Over-heated rooms mean a slowing up of workers, a menace to health, and a waste of fuel and labor. Rooms insufficiently heated mean less work accomplished because of clumsiness of cold fingers, more accidents, substandard results, and wasted materials.

The Powers System of Temperature Regulation is noted for its great accuracy and durability. May be installed in old or new buildings, for all, or any portion of the rooms.

The thermostat illustrated is typical of the Powers System. Wherever you see one, you may be assured that the system works. Smaller and more ornamental thermostats are supplied for residences, etc., if desired.

Another feature of the Powers System is the All Metal Radiator Valve—famous as the "Lastforever" Valve. SEE

Ask for Catalog "D" for further particulars.

OURADVIS IN MECHANICAL ENGINEERING

SARCO COMPANY, INC.

9 BARCLAY ST., NEW YORK

PHILADELPHIA

BUFFALO

DETROIT

CLEVELAND

CHICAGO

Steam Traps, Radiator Traps, Temperature Regulators, Metallic Gaskets



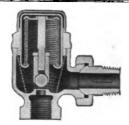
STEAM TRAP SARCO:

The Steam Trap Sarco derives its operating force from the expansion and contraction of a heavy hydrocarbon oil hermetically sealed in a cartridge. The trap requires simply to be put in position and the cartridge unscrewed a few turns. When the steam has heated the cartridge, expanding the fluid and forcing out piston, the cartridge is gently screwed forward, closing off the steam.

The adjustment can then be locked and the trap works automatically. As soon as water collects the operating fluid in the cartridge contracts and the valve opens discharging the water. Steam following the water expands instantly the operating fluid and closes the trap.

Owing to the principle of operation, no large storage capacity is required in the trap and this means a very small trap and low cost. The Sarco is the only thermostatic trap made for high pressure. It is connected straight on the line and requires no floor space or building up. It is, therefore, very easily installed.

Size Inches	Low Pressure 0-50 Lbs.	High Pressure 50-200 Lbs.
3/8	6.00	7.75 7.75
1/2 3/4	9.45 11.25	10.35 12.00
11/4	$24.15 \\ 30.00$	28.50 34.50
$\frac{2}{2\frac{1}{2}}$	38.70 51.75	48.30 60.00
3 1	60.00	75.00



THE NEW SARCO RADIATOR TRAP:

The Sarco Radiator Trap, Type D, consists of three parts: body, cap and union nipple. It is factory adjusted and can be used on vapor or vacuum heating systems, any degree of vacuum or any pressure up to 20 pounds. Absolutely no adjustment necessary. The thermo element consists of a spirally corrugated tube comparatively large in diameter, closed at one end by a solid head. The other end is so attached to the body of the valve, inside of which it is contained, as to divide the body into two chambers. Space between the expanding unit and the body forms an expansion chamber which is filled with a volatile liquid.

Valve stem is fastened to one end of expansion tube head; other end carries socket holding free revolving ball valve head. A conical strainer is fitted to body.

When steam is off, the valve is open. When steam comes in contact with inside of thermo element, the volatile liquid is expanded, moving the valve downward to its seat. Valve remains closed until condensate reaches the trap, causing volatile liquid to contract and open valve. Steam closes valve and the cycle is repeated whenever condensate collects.

Size Inches	Length Over All Inches	Distance Center Inlet to Outlet Inches	Distance Center of Valve to Face Inlet Inches	Price Each
3 8 1 2 3 4	31/2 31/2 31/2	138 138 138	2½ 2½ 2¾ 2¾	7.50 7.50 9.50

SARCO COMPANY, INC.

TEMPERATURE REGULATORS FOR LIQUID AND ATMOSPHERE:



Sarco Temperature Regulators derive their actuating motive power from expansion and contraction of a sensitive liquid hermetically sealed within the apparatus, and they require no exterior operating means. Sarco Regulators are made in three standard types: for room temperature control, for dry kiln work and for tank control. All are supplied for a given temperature and can be adjusted by

TypeTR-21

the user for any temperature 10° F. above or 10° F. below that for which the regulator is calibrated at the works.

The kiln regulator, Type KR-14, can be supplied for any desired temperature between 32° F. and 300° F. The tank regulator, TR-21, can be used for any desired temperature of liquids or atmosphere between 32° F. and 300° F.



Type KR-14
Designed Specially for Dry
Kiln Work

Sarco Temperature Regulators of other types can also be made to meet special conditions, and inquiries are invited. Sarco Temperature Regulators are supplied with direct acting valves closing with rise of temperature or reverse acting valves, opening with rise of temperature. They control steam, water or gas lines. They are also supplied with electric switches instead of valves if so desired.

Type TR-21 Sarco Temperature Regulator for Liquids and Dry Kilns

Size Inches	Weight Pounds	List Price
1/2	8	\$ 75.00
3/4	8	80.00
1	9	85.00
11/4	13	90.00
11/2	22	95.00
2	28	100.00
21/2	37	115.00
3	51	135.00
4	81	185.00
5	132	250.00
6	158	300.00

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Type KR-14 Sarco Temperature Regulator for Atmosphere up to 300° F.

Size of	V	al	v	e					List Price
1/2									\$ 60.00
3/4	٠.								65.00
1".									70.00
11/	1"								75.00
11/	2"								85.00
2"									95.00
21/	2"								110.00
3"									130.00
4"									170.00

SARCO METALLIC GASKETS:

Are made for low and high pressure steam, superheated steam, oil, gas, water, and designed for union connections, flange connections, or made in any special shape. They have an inner ring of lead, reinforced by an outside copper ring, which prevents the lead from being blown out by the steam or squeezed out when being compressed. For superheat concentric rings of soft copper are used.

AMERICAN INJECTOR COMPANY

DETROIT. MICH.

Manufacturers of Injectors, Ejectors, Jet Pumps, Drive Well Jet Pumps, Fire Plugs, Grease Cups, Oil Cups, Oil Pumps, Water Gauges, Air Cocks, Gauge Cocks, Lubricating Devices and Other Steam Specialties

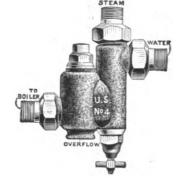
U. S. AUTOMATIC INJECTORS:

Have the following points of unquestionable superiority:

- 1. Easy to Operate
- 2. Wide Range

236

- 3. Absolutely Automatic
- 4. Never "Break" through Jarring
- 5. Backed by an Absolute Guarantee
- 6. Every Injector Carefully Tested



U. S. Automatic Injector-Regular Style

The utmost care is taken to see that every U. S. Injector leaving the factory shall be perfect in every respect. Each injector is tested on different lifts and with various steam pressures. A card is attached to the Injector showing its range, and we guarantee every Injector to work as per attached card.

Other Distinctive Features are: 1. The drip-cock. 2. The construction of disk valve on delivery tube, which, being cup shaped, is forced to rise to its seat by the jets of water thrown against it from beneath. 3. The overflow valve, which never wears leaky.

Sizes range from 1/4"-3" pipe connection, with corresponding capacities of 36 to 5800 lbs. per hour at 80 lbs. steam pressure and three foot lift, water 76 deg.

Special High Steam Injectors to work to 300 lbs. steam pressure can be furnished to order. Also, injectors with special connections.

AMERICAN EJECTORS (Model B):

The American Ejector, because of its internal construction, gives superior ser-



American Ejector-Model B

vice in raising water from deep wells, mines and pits or emptying tanks, raising and transferring liquids (hot or cold) in tanneries, dyehouses, etc., or for priming centrifugal pumps.

The jets are made of a special hard bronze and can be renewed when worn, as the body of the Ejector will last indefinitely.

GAS ENGINE "EXPLOSO" OIL CUP:



'Exploso'' Oil Cup "Exploso" Gas Engine Oil Cup is especially designed and manufactured for the class of trade demanding a Lubricator of the highest type. The filling arrangement consists of a sliding lid which makes the filling of the cup very simple and insures it being oil-tight. The sight feed opening is large and the shank is fitted with a large ball check valve to prevent back pressure entering the sight feed chamber.

With improved features an even, constant flow of oil to the cylinder is assured.

The rate of feed can be adjusted by the milled regulating screw and ratchet holding same to place.

Catalogue No. 30, giving full details about U. S. Automatic Injectors and "The Engineers' Red Book," full of practical information for the Operating Engineer, will be promply sent upon request.

PENBERTHY INJECTOR CO.

Established 1886

DETROIT, MICH.

N. Y. DEPOT

BRANCHES.

CANADIAN PLANT

71 BEERMAN ST.

LONDON, ENGLAND

PARIS, FRANCE

WINDSOR, ONT.

Manufacturers of Injectors, Ejectors, Valves, Cellar Drainers, Steam Specialties, Lubricating Devices and Carburetors



AUTOMATIC INJECTORS:

Over a Million in Use

All our claims for the "Penberthy" Injector are based on actual tests, as we have set for this machine a very high standard, which for years has been steadily advanced, and the "Penberthy"



Automatic Injector

to-day is better than ever before. Every "Penberthy" Injector is tested on the following points:

Start Low, 20 to 22 lbs. steam on 3-foot lift. Work High, 165 to 170 lbs. steam on 3-foot lift. Lift Water, 20 to 24 feet on 60 to 80 lbs. steam. Handles Hot Water,

125° to 130° at 60 to 80 lbs. steam. 115° to 120° at 100 lbs. steam. 95° to 104° at 125 lbs. steam.

XL-96 EJECTOR SIPHON OR STEAM JET PUMP:

It would be difficult to enumerate all the uses to which our jet pump is adapted, but when we say that anything and everything in the nature of a liquid (if not too thick) can be transported from one level to another, or horizontally almost any distance, we have about covered the ground; therefore, the following factories, mills, etc., will see the advantage of

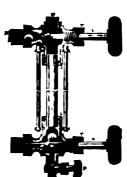
a lopting them. viz.: Chemical Works, Creameries, Cheese Factories, Tanneries, Mines, Well Diggers, Brickyards, Gas Works, Paper Mills, Steamboats, Breweries, Distilleries, etc.



XL-96 Ejector

SAFEGUARD AUTOMATIC WATER GAGE:

A high grade bronze gage tested to 300 lbs. Each gage is thoroughly tested. Self-cleaning by the action of the blow-off vibrating balls. The cleaning stem in lower shank goes all the way through into the boiler, absolutely preventing



opening from ever being closed by scale, etc. Equipped with special slow opening dripless petcock. Balls cannot seat unless glass broken, because the upper ball seat is designed to leak, which is necessary to

the perfect operation of an automatic gage, by preventing a false water level from being shown. Lugs are cast in the body to support ball in lower arm in case stem is removed. Has cap in top for replacing gage glass.

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THE CENTRAL FOUNDRY COMPANY

90 West Street, NEW YORK

CHICAGO

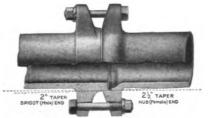
ATLANTA

SAN FRANCISCO

DALLAS

Manufacturers of Universal Pipe, Soil Pipe, F. & W. Fittings, General Castings

UNIVERSAL PIPE:



PIPE AND JOINT ARE ONE

Universal Pipe is cast iron pipe with hub and spigot ends, the contact surfaces of which are machined on a taper giving a natural iron to iron joint, which is permanently tight. By making the tapers of slightly different pitch the joint provides for expansion and contraction, vibration and uneven ground settlement.

The lengths of pipe are drawn together 238 by bolts, two bolts to a joint sufficing except for pressures above 175 pounds in some sizes. The pipe can therefore be laid at a slight labor cost, and without calking. No molten lead, oakum, etc., required. No equipment, except two wrenches.

The iron to iron contact of the Uni-

versal Ioint eliminates electrolysis. result is a pipe that does not leak and a joint that will remain tight under pressure even up to 300 pounds.

High Pressure Service: Universal Pipe is especially adapted to high pressure service, and particularly for high pressure fire lines. There is no packing to blow out, and nothing to deteriorate.

Subaqueous Work: Lines running under rivers or submerged work of any kind can be easily and economically constructed by the use of Universal Pipe.

No molten lead required, the pipe can be laid in wet trenches or in shallow water without special equipment.

Systems: Universal Pipe is particularly advantageous in high or low pressure gas lines, by reason of the tight joint under differences of tem-

perature and its freedom from electrolysis. The close contact of the smooth machined hub and spigot ends makes a joint through which gas cannot escape.

Curved Lines: Straight lengths of Universal Pipe may be laid on a curve of 100 feet



MARK

SPECIFICATIONS

ide		s No. 1 os. Pres			ass No. Lbs. Pr			ss No. Lbs. Pro			ass No. Lbs. Pr		
Nominal Inside Diameter	Approx. Thickness Inches	We	mated eight ds per	Approx. Thickness Inches	W	mated eight ds per	Approx. Thickness Inches	Wei	nated ight ds per	Approx. Thickness Inches	We	mated ight ds per	Bolt Sizes
No	Thic In	Foot	6-Ft. L'gth	Thi Tr	Foot	6-Ft. L'gth	Thi Thi	Foot	6-Ft. L'gth	Ap This	Foot	6-Ft. L'gth	
2 3 4 6 8 10 12 14 16	 .37 .43 .47 .50 .53 .565	18 30 44¼ 60½ 75½ 94½ 115½	108 180 265½ 363 453 567 693	 .40 .45 .49 .53 .57 .60	18½ 31 46 63½ 80½ 99½ 123	112½ 186 276 381 483 597 738	.35 .37 .43 .47 .525 .58 .62 .66	8½ 13 20¼ 32 49¼ 67¾ 87 107½ 134	51 78 121½ 192 295½ 406½ 522 645 804	.51	9½ 14½ 21¼ 35½ 53¼ 74 97½ 124 156	57 87 127½ 213 319½ 444 585 744 936	12 x 3 3 4 12 x 4 5 5 8 x 6 7 8 x 6 1/2 1 x 7 1/2 1 x 8 1 1/8 x 9 1 1/4 x 9 1/2

Lengths lay a full six feet. All pipe tested with a minimum hydrostatic pressure of 300 pounds per SEE

Special Castings are made with Universal hub and spigot openings, thus avoiding, except in extreme cases, the use of nipples. The lugs upon special castings are in one plane so that the branches or openings will all be in the same plane.

Approved by Fire Underwriters: Universal Pipe and Fittings have been tested and approved for fire protection service by the Underwriters' Laboratories which are under the direction of the National Board of Fire Underwriters.



MECHANICA

LYNCHBURG FOUNDRY COMPANY

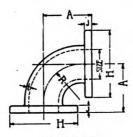
LYNCHBURG, VIRGINIA

MAIN OFFICE LYNCHBURG, VA. WESTERN SALES OFFICE 1212 PEOPLE'S GAS BUILDING CHICAGO, ILLINOIS EXPORT OFFICE 95 LIBERTY ST., N. Y.

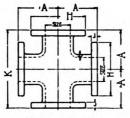
WORKS—LYNCHBURG, VA.—RADFORD, VA.—ANNISTON, ALA.

Manufacturers of Cast Iron, Bell and Spigot Pipe and Fittings
Cast Iron Flanged Pipe and Fittings; Municipal Castings of Every Description
General Founders and Machinists

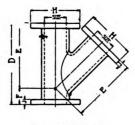
AMERICAN STANDARD CAST IRON FLANGED PIPE AND FITTINGS:



Standard Ells



Standard Crosses



Standard Laterals

Letters refer to dimensions given under respective headings in the table in adjoining column.

TABLE OF DIMENSIONS Standard 125 lbs. Pressure

SIZE	A	D	E	F	Н	J	K	R	t
1	31/2 33/4	7 8	53/4	$ \begin{array}{c} 1\frac{3}{4} \\ 1\frac{3}{4} \\ 2\\ 2\frac{1}{2} \\ 2\frac{1}{2} \end{array} $	4 4½ 5 6 7 7½ 8½ 9 9¼ 10 11 11 12½ 13½ 15	16 1/2	7 7 7½ 8 9 10 11 12 13	284 314 314 412 514 534 684 714 714 714 912 1012	10 10 10 10 10 10 10 10 10 10 10 10 10 1
1 1/4 1 1/2 2 2 1/2 3 3 1/2 4 4 1/2 5 6 7 8 9 10 12 14 15 16 18	33/4	8	534 614 7 8 91/2 10 111/2	13/4	41/2	1/2	71/2	3	17
11/2	4	9 101/2	7	2	5	16	8	31/4 31/2	1
2	41/2	101/2	8	$\frac{2\frac{1}{2}}{2\frac{1}{2}}$	6	5/8	9	31/2	7
21/2	5	12	91/2	21/2	7	116	10	4	1
3	51/2	12 13 141/2	10		7½ 8½	116 3/4 116 116 116	11	4 1/2	1
31/2	6	14 1/2	111/2	3	81/2	18	12	5	7
4	61/2	15	12 12½ 13½ 14½	3	9	16	13	514 534 614 634 714 712 812 912 1012 1214	1
41/2	7	151/2	$12\frac{1}{2}$ $13\frac{1}{2}$ $14\frac{1}{2}$	3	91/4	15	14 15 16	53/4	1
5	71/2	17	131/2	31/2	10	16	15	61/4	1
6	8 8½ 9	18	141/2	31/2	11	1	16	63/4	10
7	81/2	$\frac{20\frac{1}{2}}{22}$	116 1/6	4	12½ 13½	116	17	71/4	1 3
8	9	22	171/2	41/2	131/2	11/8	18	71/2	5
9	10	24	1191/2	4 1/2 5 5 1/9	15	1 1/8 1 1/8 1 1/6	20 22 24 28 29 30 33	81/2	1
0	11	251/2	120 5	5	16	1 16	22	91/2	3/
12	12	30	241/2		19	11/4	24	101/2	1
14	11 12 14 14 1/2	33	27 28½	6	21	13/8	28	121/4	3
15	14 1/2	34 1/2	281/2	6	221/4	13%	29	123/4	1 3
6	15	$\frac{34 \frac{1}{2}}{36 \frac{1}{2}}$	30	61/2	231/2	1 3/8	30	$12\frac{1}{4}$ $12\frac{3}{4}$ $13\frac{1}{4}$ $14\frac{1}{2}$	1
8	161/2	39	32	7	25	1 16	33	14 1/2	11/
20	18	43	35	8	271/2	1 11	36	16	11
22	20	46	$\frac{35}{37\frac{1}{2}}$	8 1/2	21 22¼ 23½ 25 27½ 29½ 32	1 18	36 40	16 1734 191/2	1 1
22 24	22	4916	$\frac{37\frac{1}{2}}{40\frac{1}{2}}$	9	32	17/8	44	191/2	11

Standard fittings guaranteed for 125 lbs. working pressure.

Extra heavy fittings guaranteed for 250 lbs. working pressure.

AMERICAN WATER WORKS ASSOCI-ATION CAST IRON BELL AND SPIGOT PIPE AND FITTINGS:

Catalogs mailed upon request.

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JAMES B. CLOW AND SONS

Established 1878

CHICAGO, ILL.

NEW YORK MILWAUKEE

DETROIT SAN FRANCISCO MINNEAPOLIS
PHILADELPHIA

St. Louis

Manufacturers of Cast Iron Pipe, Plumbing and Heating Supplies

PIPE:



Steel or Wrought Iron Threaded:

We can furnish random lengths of steel or wrought iron pipe in all standard sizes either black or galvanized. Cut lengths to order.



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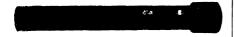
Cast Iron Hub and Spigot:

Carried in stock in sizes from 3 to 48 inches. 12-foot lengths are regular—shorter lengths will be cut to order. This pipe is made in all classes for all pressures.



Cast Iron Flanged:

Made in all sizes from 1½ to 48 inches and in all classes for all pressures. 12-foot lengths are regular—shorter lengths will be cut to order.



Cast Iron Threaded:

This pipe is made in all sizes from 1½ to 16 inches, inclusive. It is threaded at both ends the same as steel or wrought iron pipe. 12-foot lengths are regular.

FITTINGS:







Cast Iron or Malleable Screwed:

We carry a very large stock of screwed fittings in both cast iron and malleable iron, black or galvanized straight and reducing.





Cast Iron Hub and Spigot:

Water and gas fittings are carried in stock in all sizes from 3 to 48 inches, in straight and reducing sizes. We also have cutting-in specials of all kinds.









Cast Iron Flanged:

We carry a very large stock of flanged cast iron fittings in all standard sizes for low, standard and extra heavy pressures, both straight and reducing.





Cast Iron Threaded:

We make a complete line of cast iron threaded fittings for use with our threaded cast iron pipe. In both straight and reducing sizes.

All Pipe and Fittings Carried in Stock for All Pressures.

Castings for Special Purposes Made to Order.

JAMES B. CLOW AND SONS



Showroom, Chicago

In our CHICAGO BUILDING we carry a complete stock of the following material:

Plumbing Supplies including Drinking Fountains, Automatic Water Closets, Lavatories, Sinks, etc.

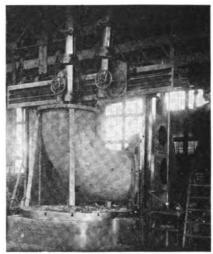
Steam Supplies including Steel and Wrought Iron Pipe, Cast Iron and Malleable Fittings, Low, Standard and Extra Heavy Valves with Screwed-Flanged-Hub and Spigot Connections-Straightway-Angle-Check-Flap, etc.

Water Works Supplies including Cast Iron Bell and Spigot-Flanged and Threaded Pipe and Fittings-Lead-Oakum-Tools, etc.

We also manufacture in Chicago the Ultra Violet Ray Water Sterilizers, Marble Products for all purposes and all Brass work for our plumbing business including Faucets, Bibbs, Traps, Supplies, Showers, etc.



Square Manhole Frame and Cover



Facing 48-inch Elbow

At our Ohio Plants, which specialize 241 on making Cast Iron Pipe and Fittings, a complete line of Cast Iron Specialties is also produced. These include the following: Manholes—Lamp Posts-Fountains-Special Castings for Coke Ovens—Filtration Plants—Sugar fineries-Chemical Companies-Oil Refineries, etc.—Radiators—Boilers—Plumbing Specialties such as Bell Traps-Drum Traps-Gratings, etc.

CATALOGUES:

Complete Catalogues will be gladly sent to you describing that in which you are interested.

Plumbing—Catalogue "M."

Drinking Fountains-Fountain Catalogue.

Heating-Special Catalogue.

Cast Iron Pipe, Fittings and Foundry Products-Pipe Economy.

Steam and Water Work Supplies-Catalogue "A."

Water Sterilization—R. U. V. Catalogue.

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UNITED STATES CAST IRON PIPE & FOUNDRY COMPANY

GENERAL OFFICE: BURLINGTON, NEW JERSEY

Manufacturers of Cast Iron Pipe—Bell and Spigot, Flange, Flexible Joint, High Pressure Fire Protection Lines, Plain End and Threaded. Fittings—Bell and Spigot Flange, Steam—Semi-Steel and Cast Iron, Standard and Special. Columns—Cast Iron Building. Culverts—Cast Iron. Condensers—Barometric. Castings—Chemical and Gray Iron, Semi-Steel, Hydraulic, Etc., I Lb. to 50 Tons.

SALES OFFICES

Philadelphia, 1421 Chestnut St. Chicago, 122 So. Michigan Blvd. San Francisco, Monadnock Bldg. Dallas, Tex., Scollard Bldg. Philosophy Birmingham, Ala., Am. Trust Bldg. Buffalo, 957 E. Ferry St. Cleveland, 1150 E. 26th St. Minneapolis, Plymouth Bldg.

Minneapolis, Plymouth Bldg.

Addyston, Ohio ANNISTON, ALA. BESSEMER, ALA.

BURLINGTON, N. J. BUFFALO, N. Y. SCOTTDALE, PA.

BIRMINGHAM, ALA. CHATTANOGGA, TENN. LOUISVILLE, KY.

CLEVELAND, OHIO COLUMBUS, OHIO



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U. S. CAST IRON PIPE:

Cast Iron Pipe has a record of 260 vears of continuous service in one installation. It resists the attacks of frost, rust and superimposed loads for decades, and even then has a definite salvage value.

Cast Iron Pipe for Water, Sewer, Gas. Drains, Culverts, Oil, High Pressure Fire Protection, of stations, warehouses, terminal shops, etc. Power and Industrial Plant Piping and Submerged Lines. In all sizes, 2" ENGINEERIN

to 84" diameter.



UNITED STATES CAST IRON PIPE & FOUNDRY COMPANY

GENERAL OFFICE: BURLINGTON, NEW JERSEY



Special Breeches Pipe

FITTINGS:

Standard and Special: Bell and Spigot to American Water Works Standard. Flanged to A. S. M. E. 1914 Standard. American Gas Institute Standard.

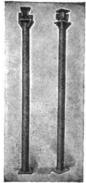
Hydraulic

Drainage

Steam Fittings

Semi-steel and cast iron

KEYSTONE COLUMNS are of cast iron, and are supplied with specially designed base plates and caps or with



"Keystone" Columns

our Combination Caps where floor beam connections are required. They are

widely used in the construction of Churches and Schools, Factories, Mills, Warehouses, Sheds, Stores, and other commercial buildings and for many special purposes.

BAROMETRIC CONDENSERS:

243

Made in accordance with recent improvements for economical operation, in all regular sizes.

GENERAL CASTINGS:



Rings and Mushrooms

Chemical, Sugar House and Machinery Castings. 1 lb. to 50 tons in the rough or machined. Hydraulic cylinders, presses, accumulators, caustic pots, retorts, montejus, refining kettles, refrigerator tanks, etc.

GRINNELL COMPANY

EXECUTIVE OFFICES: PROVIDENCE, R. I.

Branch Offices in all leading cities of United States and Canada



Products:

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Automatic Sprinkler Systems Steam, Hot Water and Gas Heating Power and Related Piping Pipe Bending, Threading and Fabricating Welding Fittings, Pipe Valves Process Piping of all kinds Piping for Acids and Alkalies and other Special Materials Compressed Air Lines Compressed Air Cleaning Systems Hydraulic Piping Water Supply Systems Gordon Dryers Safety Fuel Saver Constant Level Size Circulating System

THE GRINNELL AUTOMATIC SPRINKLER SYSTEM:

Spray Cooling Systems

Has been in successful operation for more than 30 years. Over 20,000,000 Grinnell Sprinkler heads are safeguarding business property valued at approximately three billion dollars. The average loss in over 20,000 recorded fires is less than

\$300,—a reduction of over 96% on the lowest average fire loss previous to the invention of this system.

OPERATION:

When fire breaks out and causes the fusible strut of the sprinkler head to melt, the glass valve, found only in the Grinnell head, is thrown from its seat, allows the water to rush out and effectively drenches an area of 80 to 100 square feet.

The operation of the sprinkler head immediately and automatically gives the fire alarm.

INSTALLATION:

Grinnell Automatic Srinkler Systems are factory assembled. The equipment comes to the job ready for quick installation by our erecting crews. This reduces interference with usual plant operation to a minimum. Individual system is scientifically designed to secure the utmost protection and economy in the layout of the system. Our long experience in this work enables us to insure satisfactory service even under the most difficult conditions.

FOR CHEMICAL PLANTS:

The Grinnell Automatic System is particularly adapted for use in chemical plants.

GRINNELL COMPANY

EXECUTIVE OFFICES: PROVIDENCE, R. I.

Branch Offices in all leading cities of United States and Canada

CORROSION:

Where fumes and corrosive vapors are more than ordinarily severe, we can install a glass-capped Grinnell sprinkler head which effectively safeguards working parts and coats all acid-resisting and corrosion-proof Bitumastic Enamel.

DRY PIPE SYSTEMS:

For conditions where freezing temperature is likely to be experienced, we install the Grinnell Dry Pipe System, in which the pipes are normally empty until the opening of a sprinkler head automatically sets the system in operation. We have now further quickened and improved this system by the invention of the Grinnell Dry Valve Acceleration.

GRINNELL DRY VALVE ACCELER-ATOR:

One of the most remarkable improvements in dry pipe operation. Makes the dry pipe system practically as quick operating as the wet system. Permits more heads per valve, lowers insurance rates, reduces maintenance cost. Approved by the Underwriters' Laboratories and may be applied to existing dry pipe systems.

INSPECTION AND SERVICE:

sole duty it is to inspect Grinnell Sprinkler equipments and render full reports to the owners on such inspections with practical suggestions for needed changes.

PIPE, PIPE FITTINGS AND SERVICE:

The Grinnell Company is among the largest users of piping in America, consequently our Engineering Department is exceptionally qualified to advise upon or construct the largest and most elaborate piping installations whether for air, water, steam, gas or hydraulic.

We make our own fittings, of exceptional 245 quality and we have a large and wellequipped plant for cutting, threading, bending and all pipe operations.

We also plan and install, spray cooling systems, full economizer size circulating systems for textile plants as well as complete piping installation for chemical plants; in steel, wrought or galvanized iron, spiral riveted brass, copper or special lined piping with suitable valves, fittings and all accessories complete.

DESIGNS AND ESTIMATES:

Inquiries addressed to our head office or to any of our branches will immediately receive the attention of our engineering staff, who will promptly furnish any in-This company has a department whose | formation, designs or estimates required.

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M. J. DOUGHERTY CO.

OFFICE: NORTH AMERICAN BLDG.

FACTORY: 16th and Washington Ave.

PHILADELPHIA, PA.

NEW YORK OFFICE: 23-31 W. 43RD ST.

CHICAGO OFFICE: 112 W. ADAMS ST.

PIPING FABRICATORS & ERECTORS

Pipe Bends, Welded Pipe Headers, Valves, Flanges, Fitting, Etc., and Fabricated Pipe Work of Every Description

THE SQUARE LAP FLANGE:

Leading Engineers invariably will specify pipe flanged by the Square Lap (Vanstone) Joint, as it is made to suit all purposes of pipe line connections. The DOUGHERTY improved system of manufacture is recognized as the ideal.

The Square Lap Flange is made by turning over the end of the pipe and facing off to insure even bearing of the gaskets. The flanges are loose, thus saving the erector time in setting the bolt holes in place. The lap being rolled to the inside



edge of the bolt hole, maximum bearing for gasket is obtained, and the water pocket eliminated. The lap is 75% heavier at the radius than the walls of the pipe, and machined on the face, edge and

The Dougherty Square Lap Joint is made in the standard and extra heavy weight pipe with high hub cast iron, semi-steel and forged steel flange. Detailed table of weights and measurements will be furnished upon request.

PIPE BENDS:

back.

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The inauguration of high pressure boilers and engines has necessitated many

marked improvements in the piping of steam plants. To allow for expansion and contraction and to give flexibility in pipe lines, special bends are now a necessity. Our factory is equipped to bend pipe of any diameter to sketch and to fit



same with screwed, welded or with our improved Square Lap Flange. Detailed tables of Quarter and U-Bends will be furnished upon application, but expansion and other special bends must be given special consideration.

WELDING:

Our Butt and Ring reinforced line-weld has surpassed all other known methods of welding ends of pipe together. It entirely eliminates the use of flanges on long lines of piping—thus saving considerable initial expense.

STEEL HEADERS:

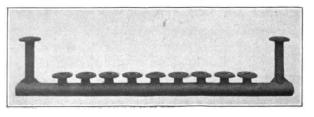
Steel Headers with welded nozzles are recommended for severe service and superheated steam, as they reduce the number of joints under all steam and water conditions. They prevent leaky joints and give as near one hunderd per cent. piping results as are possible.

A recent improvement inaugurated in all M. J. Dougherty header work is the reinforcing ribs on all nozzles of any length, as shown on the two end outlets in the illustration below. Also worthy of your consideration is our facility for reducing and increasing the end of pipe.

Equipment of all welded headers with the Square Lap Flange is recommended on all high pressure steam lines. The illustrated header is so equipped.

OUR FACILITIES:

We fabricate and erect complete, piping for all power purposes, either to our own measurement and plans, in which case we take all responsibility, or according to blue prints to be submitted by you. Or, if you so desire, we can furnish materials only.



WHITNEY-MACDONALD COMPANY

Manufacturers and Contractors

TIOGA AND MEMPHIS STREETS, PHILADELPHIA, PA.

We fabricate pipe for all kinds of piping systems.

We contract to furnish and erect piping systems in all parts of the world.

We make pipe bends of all descriptions.

We make Lap Joints.

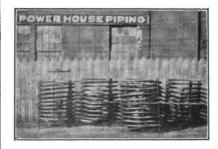
We make Pipe Coils.

We do all classes of Oxy-Acetylene Welding.

We make pipe hangers and similar blacksmith forgings.



6" x 4" x 3" Hydraulic Welded Tee for 3000 lbs. working pressure. All joints and flanges welded.



Pipe Coils.



7" U Bend with 10" welded nozzle.

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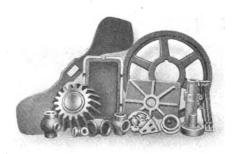
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MALLEABLE IRON FITTINGS CO.

INCORPORATED 1864

BRANFORD, CONN.

Manufacturers of Malleable Iron Pipe Fittings for Gas, Steam and Water; Steel Fittings for High Pressure Service; Air Furnace Refined Malleable Iron and Semi-Steel Castings; Carbon and Alloy Steel Castings; Foundry Vibrators; Boat Hardware; Clamps; Oilers; and Hardware Specialties



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EXTRA HEAVY FLANGES:

For High Pressure Requirements

For Rolled, Shrunk or Welded Connection, bored, countersunk, grooved, faced and drilled to specification.

HIGH PRESSURE FITTINGS:

Standard Sizes in Stock in Steel or Malleable

Machined, tested and ready for the line. Specials made to order for railroad, manufacturing, mining and municipal power plants in compliance with Lloyds Rules or Regulations of the U. S. Steamboat Inspection Service.

MALLEABLE IRON AND SEMI-STEEL CASTINGS:

For Machinery; Automobile; Gun; Sewing-Machine; Overhead, Third-Rail, underground Electrical Construction and all miscellaneous work.

LOW CARBON STEEL CASTINGS:

Equal to Crucible Steel Castings.

SPECIAL METAL "A:"

For Gears and Cams where resistance to wear is wanted. May be heat-treated to required hardness.

AIR FURNACE REFINED VANADIUM IRON:

For Hydraulic Cylinders, Piston Rings, Forging Dies, Heavy Duty Gears, etc. Has a high tensile strength; and is tough, sound and dense.

CUSTOM AND JOBBING DEPART-MENT:

Galvanizing, Tinning, Japanning, Contract Machining of Malleable Iron, Grey Iron, Wrought Iron and Steel. Galvanized Nails—Marine Hardware.

READING VALVE & FITTINGS CO.

READING, PENNA.

Manufacturers of Reading Open Hearth Steel Flanged and Screwed Fittings and Flanges



READING STANDARD OPEN HEARTH STEEL FITTINGS:

Flanged or Screwed

Are guaranteed for 250 lbs. working pressure and are tested to 1000 lbs. hydrostatic pressure before shipment.



READING MEDIUM OPEN HEARTH STEEL FITTINGS:

Flanged or Screwed

Are guaranteed for 250 lbs. working pressure and are tested to 1000 lbs. hydrostatic pressure. This line of fittings has standard section of metal wall, extra heavy diameter of flanges, standard thickness of flanges to extra heavy face to face and center to face dimensions.



READING EXTRA HEAVY OPEN HEARTH STEEL FITTINGS:

Flanged or Screwed

Are used for superheated steam or very high pressure or temperature and are guaranteed for 350 lbs. working pressure and a total temperature of 800° Fahrenheit.

All sizes in stock-one to 36 inches.

We perform every operation from pig iron to pipe line in our plant of over six acres.



Write for Catalog describing Fittings and Flanges in detail.



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240

PENNSYLVANIA FORGE CO.

OFFICE AND WORKS: BRIDESBURG, PHILADELPHIA, PA.

Manufacturers of Steel, Bronze and Monel Forgings

FORGED STEEL FLANGES:

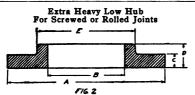
Dimensions shown below have been recommended as standard by the A. S. M. E.

Flanges are smooth forged to the given sizes, except additional material is allowed on the face for finishing. Any dimension may be increased as desired.

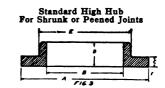


	Nomi- nal Size Inches	Out- side Diam A	Diam. Bore B	Th'k- ness C	Depth of Hub D	Diam. of Hub E	W'gt Lbs.
	21/2	6 7 7½	21/8 21/2	5/8 11	1	3½ 3½ 3½	7 9
	31/2	812	31/8 35/8 41/8	11	1 %	4 % 5 3%	10 14 16
	4½ 5 6	10	45/8 51/8 6 A	,#	1 1/4 1 1/4	5 H 6 H	17 19 23
•	7 8	121/2	6 to 7 to 8	11/8	1 1/2	8 % 9 1	31 36
	$\frac{9}{10}$	15 16 19	10 1	11/8	13/4 17/8	105%	44 51 74
	14	21	13 14	136	2 1	15 1	96

250

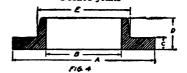


			_			
Nomi- nal Size Inches	Out- side Diam. A	Diam. Bore B	Th'k- ness C	Depth of Hub D	Diam. of Hub E	W'gt Lbs.
3/4 11/4 11/2 2 21/2 3 31/2 4 4 4/2 5 6 7 8 9	4 4 1/2 5 6 6 1/2 7 1/2 8 1/4 9 10 10 1/2 11 12 1/2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	5/8 118 24 3/4 7/8 1 1 1/8 1 1/8 1 1/4 1 1/4	1 1 1,18 1,18 1,18 1,18 1,18 1,18 1,18	13/8 21/28 21/28 33/8 411 5518 667 91/8	3 4 5 7 10 14 17 21 28 31 33 43
7 8 9 10 12 14 15 16 18 20	12/2 14 15 16/4 17/4 20/2 23 24/4 25/2 28 30/4	6 % 7 % 8 % 8 % 8 % 8 % 8 % 8 % 8 % 8 % 8	1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 3 3 3 3 3 3 3 3 3 5 5 5 5 5 5 5 5	91/4 101/4 112/4 12/4 15/4 15/4 15/4 20/4	54 62 73 83 123 160 190 210 230 270



Nomi- nal Size Inches	Out- side Diam. A	Diam. Bore B	Th'k- ness C	Depth of Hub D	Diam. of Hub E	W'gt Lbs.
4	9	43/8	#	23/16	534	20
4 1/2 5	10	5 1	1 #	214	61/8	21 23
6 7	11 121/2	734	1	2 1	77/8 9	27 34
8 9	131/2	81/2	⊥i i	25%	10	40
10	15 16	105%	11/6	3 3	111/8	48 56
12 14	19 21	125/8	1 1/4	3%	14 1/2	88 110
15	221/4	14 1/8	i%	312	16%	122
16	231/2	151/8	1 76	35%	18	140

Extra Heavy High Hub
For Van Stone, Single Riveted, Shrunk or
Peened Joints



Nomi- nal Size Inches	Out- side Diam. A	Diam. Bore B	Th'k- ness C	Depth of Hub D	Diam. of Hub E	W'gt Lbs.
4	10	438	11/8	31/8	5%	28
4 1/2 5	101/2	5 1	11/4	314	61/4	34 37
6	121/2	61/2	11/	31/4	711	45
7	14	71/2	17	33%	91%	55
8 9	15 161⁄4	81/2	13%	31/2	10 1	62 74
10	1712	105%	ik	334	125%	90
11	1834	115%	1 1	3 1/8	135%	112
12	201/2	125%	15%	4	1434	131
14	23	13 1/8	134	4 3/8	16 👬	182
15	24 1/2	14 7/8	11	4 1/2	1714	196
16	251/2	15 1/8	11/8	434	181/2	223
18	28	17 1/8	2	5	20%	295
20	301/2	191/8	21/8	53%	221/2	316

Flanges of other dimensions furnished on specification.

We are prepared to furnish flanges completely machined, including facing, drilling and threading.

Also Connecting Rods, Piston Rods, Crank Shafts, Rolls, Die Blocks, Hammered Bars, Weldless Rings, Spindles, Hot Rolled Bars, Forging Bars, Billets (Rolled or Pressed Cogged) Alloy Steel, 3½% Nickel, 5% Nickel, Chrome Nickel, Chrome Vanadium, Silico-Manganese, etc.

E. B. BADGER & SONS COMPANY

75 PITTS ST. BOSTON, MASS.

101 PARK AVENUE NEW YORK, N. Y.

Manufacturers of Badger Equalizing Expansion Joints for High and Low Pressure

BADGER SELF-EQUALIZING EXPANSION JOINTS:

Are one-piece Joints made from Seamless Copper Tube, with deep corrugations properly designed to stand the repeated changes in shape due to temperature changes in pipe line.

The expansion is controlled in the Joints by Equalizing Rings fitted to the corrugations, which equally distribute the expansion over each corrugation, thus eliminating the possibility of fracture in the copper, due to having one corrugation take up all of the traverse.

Once they are installed with the necessary anchors and guides, they require no further attention as they are one-piece Joints and never require packing.

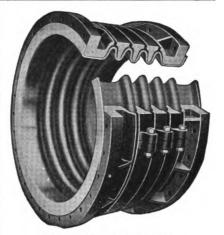
They are made for high and low pressure, each Joint being subjected to a hydraulic test before shipment.

Badger Self-equalizing Expansion Joints installed in your pipe lines will eliminate all future expansion troubles, and give you the maximum service at the least cost.

BADGER EQUALIZING EX-PANSION JOINTS are made two corrugations to care for 1" expansion

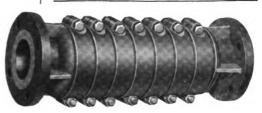
four corrugations to care for 2" expansion.

We are also manufacturers of the Badger Single-corrugation Expansion Joint for connection between turbines and condensers, and designed for any special requirements.



Face to Face Dimensions

Size	Two corrugations	Four corrugations
6"	121/6"	19"
8"	121/2"	19"
10"	121/2"	19"
12"	13"	20"
14"	131/2"	20"
16"	131/2"	20"
18"	14"	21"
15" 22" 24"	15"	211/2"
22"	15"	211/2"
94"	151/4	994



Face to Face Dimensions

Size	Four corrugations	Eight corrugations
11/2"	11 & " 11 & "	18# " 18# "
21/2" 3"	11 ሺ ″ 11 ሕ ″	18
316." 4."	11 % "	18 "

Write for our catalog No. 12.



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(See page 181 for additional products of this Company)

BARCO MANUFACTURING CO.

CHICAGO, ILLINOIS

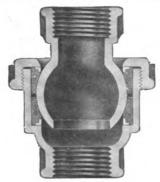
Manufacturers of Barco Flexible Joints and Crossheads and Crosshead Shoes

BARCO FLEXIBLE JOINTS:

These joints have now been on the market over twelve years, and are well known to engineers and users of flexible joints everywhere for their efficiency and durability.

We recommend them very strongly wherever a flexible connection is required for steam air.

flexible connection is required for steam, air,



Pat. 1-6-03 Pat. Pend.

oils, gases and water, either under pressure or suction.

Barco Flexible Joints consist of three metallic parts and two non-metallic gaskets which sur-round the ball and prevent it from coming in contact with the other metallic parts, i. e., the and casing. The gaskets offer a firm resisting



Straight Joint



Angle Joint

seat somewhat softer than the ball, but hard seat somewhat softer than the ball, but hard enough to keep perfect shape without disintegration. The fact that the gaskets are softer than the ball and conform to its surface accounts for the absolute tightness of the joints under all conditions, and the self-lubricating feature of the gaskets insures free, easy movement with minimum wear. They are interchangeable, or renewable at small cost, making the joint practically new. The gaskets are very durable and will last a long time.

In steel mills for water cooled doors and tracks. On pile drivers.

On pile drivers.

Around coke ovens to replace rubber hose. Laying pipe lines on pontoon or temporary

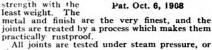
Expansion joints on pipe lines—large of On sprinkler cars for electric railroads. -large or small. Loading and unloading oil lighters and barges. Steam heating oil lighters and barges. For vulcanizing presses.



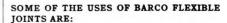
Angle Joint Angle Both Ends



Barco Flexible Joints are made in any metal or materials in common use, but are regularly fur nished in bronze and malleable iron in the screw ends, and cast iron in the flange ends. The bronze joints are recommended for the best service. Barco Malleable Iron Joints combine the greatest the greates. strength with the



air pressure.



On steam shovels and dredges, and sand suckers. Movable pipe lines in mines and quarries for rock drill and channeling machines.

Blowing off locomotives in railroad round-

Blower pipe arrangements in railroad round-

Connection between engine and tender for steam, air, crude oil and feed water.

Testing blocks of engine, pump and boiler manufacturers.

Steamships and engine rooms to take up ex-

pansion or vibration in steam pipe lines.

For pneumatic hoists and traveling cranes.
On steam brick presses.
In connection with steam irons.
On Lidgerwood unloaders.

Con Lidgerwood unloaders. Connection to rapid unloaders.

Laying pipe lines across rivers. To replace rubber hose in cleaning boiler flues. hose in

Steam syphons and piping service generally mines

Replacing rubber hose for heating cars at railroad terminals Connection to compressed air locomotives.

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ENGINEERING

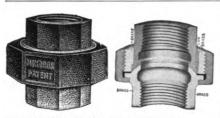




Hexagon Mar [End **Toint**

ILLINOIS MALLEABLE IRON CO.

1801-25 Diversey Parkway, CHICAGO, ILL.



NOKOROS UNION (PATENTED):

The only union made absolutely noncorrosive at all contact points.

Non-corrosive brass to iron thread connection.

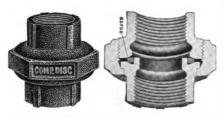
Non-corrosive brass to iron seat between ring and tail-piece.

Octagon shape, a monkey wrench will turn.



IMICO UNION (PATENTED):

New Imico unions are made of malleable iron, extra heavy, with bronze metal valve seat disc and non-corrosive ring connection.



C. D. RAILROAD UNION (PATENTED):

Heavy pattern malleable iron with brass valve seated disc. The face of each threaded section is beveled to receive a brass disc, and the connecting up of the union COMPRESSES the brass disc against the recesses, making a permanent steam metal seat.

NOKOROS UNION PRICE LIST

Size	Price					
Inches	Plain, each	Galvanized, each				
1/8	.30	.45				
3/8	.30	. 45 . 60				
32	. 50	.75				
11/4	1.20	1.20 1.80				
2 2	1.60 2.00	2.40 3.00				
31/2	3.20 4.80	4.80 6.50				

IMICO UNION PRICE LIST

Size	PRICE					
Inches	Plain, each	Galvanized, each				
14	.30	.45				
1,6	.40	.60				
34	. 60	.90				
1	. 80	1.20				
11/4	1.20	1.80				
11/2	1.60	2.40				
2	2.00	3.00				

C. D. RAILROAD UNION PRICE LIST

Size	Price					
Inches	Plain, each	Galvanized, eac				
1/4	.30	.45				
3/8 1/2	.40	.60 .75				
1	.60 .80 1.20	1.20 1.80				
1 1/2	1.60	2.40 3.00				

Also manufacturers of malleable and cast iron fitting.

Write for catalogue.

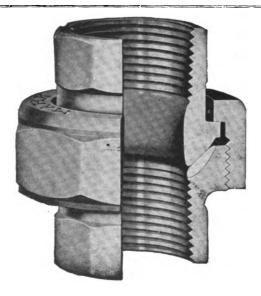
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MARK MANUFACTURING CO.

P. O. Box G, CHICAGO, ILL.

Makers of Wrought Pipe and Couplings, Boiler Tubes, Electrical Conduit, Well Casing, Well Points, Pump and Well Cylinders, Well Strainers, Well Valves and Tools, Pipe Cutters, Vises, Threading Dies and Pump and Well Supplies



254



Leakless—Rustless After Repeated Use

Cold drawn from rolled steel, the logical union material for use on steel pipe.

A union with the same degree of expansion and contraction as the steel pipe on which it is used—a practical and lasting remedy for union leakage.

A union pressed—not cast—and therefore free from blow holes, sand holes and other defects.

The Mark has a steel-to-brass seat, the brass being welded in and therefore an integral part of the union. The perfectly tapered threads make coupling and uncoupling an easy task, even after years of service.

It is designed to stand either high or low pressure, all sizes being equally strong.

The Mark will never freeze to the pipes. Its entire surface is rust proofed.

SIZES AND LIST PRICES

Pipe Size	List Price
½°	. 0.30
1/4"	. 0.30
3/8"	. 0.40
1/2"	. 0.50
3/4"	. 0.60
1"	. 0.80
11/4"	. 1.20
11/2"	. 1.60
2"	. 2.00
21/2"	. 3.20

H. W. JOHNS-MANVILLE CO.

NEW YORK CITY

10 Factories

Branches in 64 Large Cities

Asbestos and Magnesia Products

Power Plant Specialties

Johns-Manville Service to power-users has its effect in reducing the expense of plant maintenance. It acts through power conservation right back to the ultimate reduction of your bills for fuel and labor.

Johns-Manville Service embraces a complete line of maintenance materials designed to save heat, friction, wear and labor. The service rendered by each of these products is assured by Johns-Manville Responsibility, a business principle that places the user's satisfaction above all other considerations.

JOHNS-MANVILLE INSULATIONS: **Heat Insulations**

Asbesto-Sponge Felted Insulation (sectional, sheets and blocks).

85% Magnesia Insulation (sectional, sheets and blocks).

Asbestos Fire-Felt Insulation (sectional, sheets and blocks).

Thermo Fire-Felt Insulation (sheets and blocks).



Asbesto-Sponge Felted Pipe Insulation Johns-Manville

One of the Johns-Manville line of Pipe Insulations

Vitribestos Insulation and Stack Lining sheets.

Asbestocel Insulation (sectional, sheets and blocks).

Air-Cell Insulation (sectional, sheets and blocks).

Cold Insulations:



Brine and Ammonia Pipe Insulation (built-up).

Anti-Sweat Insulation (sec-

Zero Insulation (sectional).

JOHNS-MANVILLE PACKINGS:

Sea Rings-for rods and plungers.

Universal-for pistons.

Mogul-for valve stems and small rods.

Kearsage Boiler Gaskets.

Asbestos Wick and Rope.

Sheet Packings and Gaskets

Service Seigelite

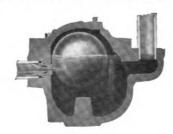


Johns-Manville Sea Ring

An automatic steam, air and hydraulic packing.

Long life and service are obtained from Sea Ring Packing, because, by preventing 255 unnecessary pressure and friction between Rod and Packing, needless wear is eliminated. Leakage is prevented because the flexible lip readily conforms to the action of the rod or plunger.

JOHNS-MANVILLE STEAM TRAP:



Only three parts—the body, the rolling ball and the discharge bushing-nothing to get out of order.

JOHNS-MANVILLE POWER PLANT SPECIALTIES:

Asbesto-Metallic Friction Blocks Refractory Cements Mobiline Baffle Walls Aertite Boiler Wall Coating Stack Preservative Vulcabeston Pump Valves



MAGNESIA ASSOCIATION OF AMERICA

721 BULLETIN BUILDING, PHILADELPHIA, PA.

Executive Committee of the Association

GEORGE D. CRABBS ALVIN M. EHRET J. R. SWIFT R. V. MATTISON, JR. WILLIAM A. MACAN, Chairman
The Philip Carey Co.
Ehret Magnesia Mfg. Co.
The Franklin Mfg. Co.
Keasbey & Mattison Co.

Cincinnati, Ohio Valley Forge, Penna. Franklin, Penna. Ambler, Penna.

"85% MAGNESIA" INSULATIONS:

For Pipes and Boilers



Product: "85% Magnesia" is an inorganic, inert mineral composition, composed of eighty-five per cent of commercially pure carbonate of magnesia, with which is incorporated sufficient mineral fiber to act as a binder, thus giving the necessary structural strength.

Nature: It consists of myriads of microscopic crystalline cells, each one holding enmeshed an infinitesimal particle of dead air—the only accepted, scientific, principle of perfect heat-insulation.

Application: "85% Magnesia" is manufactured in the form of half sections, for pipes up to 10" in diameter, segments for larger-sized pipes and curved surfaces, blocks for boilers and flat surfaces, and plastic (or fibrous powder) for irregular surfaces, filling of joints, etc.

Efficiency: The efficiency of "85% Magnesia" is equal to a saving of from 75% to 97% of the total heat wasted by bare pipes, the percentage varying somewhat with the temperature and thickness. For the correct thickness for maximum saving at all pressures and temperatures, see opposite page.

General Experience: The insulation value of "85% Magnesia" coverings is attested by the records of over thirty years' experience in the U. S. Navy, the leading steamship lines, railroads, locomotive-builders, power- and heating-plants and the largest hotels, public buildings, skyscrapers and other large structures in America and elsewhere.

Handbook: A practical handbook, "Defend Your Steam," dealing fully with the manufacture, uses, and application of "85% Magnesia" coverings and with the theory and practice of Heat Insulation, will be sent free on request.

Specifications: Also a standard specification revised in accordance with latest information, for the application of "85% Magnesia" coverings.

MAGNESIA ASSOCIATION OF AMERICA

THICKNESS OF "85% MAGNESIA" FOR MAXIMUM NET SAVING S-Standard Thickness. DS-Double Standard Thickness.

COAL AT \$2.00 PER TON

Size Pipe	Hot Water 175° F.	Steam 5-Lbs.	Steam 100- 200 Lbs.	200 Lbs. 150° F. Super- heat	
1½" 3" 6" 12" 24" Flat	S S S S S S S S S S S S S S S S S S S	S S S S S S 11/2"	S S S 11/2" 11/2" 2"	11/4" 11/4" 11/4" 2" 2" 3" 3"	DS DS DS DS DS DS 31/2"

COAL AT \$6.00 PER TON

Size Pipe	Hot Water 175° F.	Steam 5 Lbs.	Steam 100- 200 Lbs.	200 Lbs. 150° F. Super- heat	
1½" 3" 6" 12" 24" Flat	S S S 11/2" 11/2" 11/2"	S 114" 114" 2" 2" 2"	DS DS DS DS DS DS 4"	2" 2" 3" 4" 4" 5"	2" 3" 3" 4" 4" 5" 6"

HOW TO USE THESE TABLES:

Determine the following factors: Cost of coal, steam-pressure and size of pipes. Select the table nearest to the cost of coal, and the column nearest to the steam-pressure or temperature. The thicknesses in this column are the proper thicknesses for the pipe sizes given at the

Example.—Cost of coal \$3.75, steam-pressure 150 pounds, size of pipe 12 inches. Select the \$4.00 per ton table, and the third column headed Steam 100-200 Lbs. Run down this column to the 12-inch line and find the proper thickness for maximum net saving to be DS (= Double Standard).

These tables are based on average conditions. In transforming the steam-cost to coal-cost, it has been assumed that 75% of the cost of steam is coal-cost, that one pound of coal will evaporate seven pounds of water, and that each

COAL AT \$4.00 PER TON

Size Pipe	Hot Water 175° F.	Steam 5 Lbs.	Steam 100- 200 Lbs.	200 Lbs. 150° F. Super- heat	
11/2" 3" 6" 12" 24" Flat	S S S S S S	S S S S 1 1/2" 1 1/2" 2"	11/4" 11/4" DS DS DS DS DS 3"	DS DS DS 3" 31/4" 31/4"	2" 2" 3" 4" 4" 5"

COAL AT \$8.00 PER TON

Size Pipe	Hot Water 175° F.	Steam 5 Lbs.	Steam 100- 200 Lbs.	200 Lbs. 150° F. Super- heat	
1½" 3" 6" 12" 24" Flat	S S 1½" 1½" 2" 2" 2½"	1½" 1½" 2" 2" 3" 3" 3½"	11/4" 2" 3" 3" 3" 4" 41/4"	2" 3" 4" 4" 5" 6"	3" 3" 4" 5" 5!/2"

pound of steam contains 1,000 B. T. U. above the feed-water temperature.

The thicknesses given in these tables are the proper thicknesses for the maximum net saving for each condition, based on a period of service of 8,760 hours per year. Where pipes are cold part of the year, multiply the cost of coal by the number of hours per year the pipes are hot and divide by 8,760; use the value obtained instead of the actual coal-cost. 20% has been allowed as the cost of application, and 13% of the total cost for the annual fixed charges (6% interest, 5% depreciation, 2% miscellaneous). The value of the heat-losses used in calculating the net savings are based on a series of experiments, covering a period of three years, made for the Magnesia Association of Amer-888 ica by the Mellon Institute of

Industrial Research of the Uni-

versity of Pittsburgh.

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AMERICAN DISTRICT STEAM CO.

- GENERAL OFFICES AND WORKS NORTH TONAWANDA, N. Y.

NEW YORK

CHICAGO

SEATTI.R

Engineers-Contractors; "District Steam Heating Systems;" Steam Specialties

DISTRICT STEAM HEATING SYS-TEMS:

Over 400 Electric Light, Power and Railway Companies are selling their Exhaust Steam during the heating months of the year for heating stores, offices, public buildings, schools, churches, residences, etc.

One of our representatives will be glad to call on you, make an investigation of your conditions and report on same.

258

"ADSCO" STEAM SPECIALTIES:

Steam Pipe Casing

Expansion Joints

Angle Fittings

Adjustable Wedges

Cast Iron Pipe Fittings

"ADSCO" Radiator Valves, Graduated

Heaters "Water"

"ADSCO" Damper Regulators

St. John Indicating and Recording Steam Meters

Condensation Meters

Steam Traps, High and Low Pressure

Reducing Valves, High and Low Pressure

Gauges-Mercury



St. John Indicating and Recording Steam Meter

(Ask for Bulletin 146-A.)

Write for our booklet "District Steam Heating"

Our Bulletin 150 describes the Adsco system of atmospheric steam heating. It will be sent for the asking.

THE PICKERING GOVERNOR CO.

PORTLAND, CONN.

Manufacturers of Governors for Steam Engines and Turbines, Gas Engines, Mechanical Control and Speed Limit

THE PICKERING GOVERNOR:

Owing to the absence of joints our Governors are very responsive to slight changes in load, moving quickly and positively into correct position for maintaining the admission of steam proportionate to the duty required of the engine. Absence of joints gives maintenance in efficiency under continued and severe duty.

Greatest range in speed adjustment with close regulation at all points.



Fig. 33
Class B represents
Governor with Speed
Ranger by use of which
the speed of Engine
can be varied while in
mction. Sawyer's
Lever is also included.

All Governors equipped with Wide Range Speed Changer.

U. S. A. & Foreign Patents.

We build to meet special conditions whenever practical and are pleased to submit suggestions on request.



Detail of the Speed Ranger

Fig. 34
Class A, to which is added the Automatic Safety Stop.
This Stop closes valve when belt breaks or runs off pulley, and is simple and certain in its action.



25

Pickering is standard for specifications in steam practice the world over.



We offer our services with over fifty years' successful experience.

TABLE OF DIMENSIONS, ETC., FOR CLASSES A AND B

Size of Governor Diameter of Opening		1 1/2 "	2"	21/4"	21/2"	3"	314"	4"	412"	5"	6"	7*	8"	9"	10"
Dia. of Base Flange Dia. of Side Flange	Serd or 41/2 Serd		6 Serd		7 Serd or 7	71/2 71/2			9¼ 9¼	10 10		12 1/4 12 1/2			16 16
From Cen. to Side Flange Base to Center of Inlet.	31/4	3½ 35%	414	41/4	41 ₂ 51 ₈	5 5 1 5	614	6½ 7½	73/8	<u>8</u>	81/2		10	111/2	1134 1134
From Cen. to End of Brg. Extreme Height	614 2014	8 24	8 25 1/8	918 2714		$\frac{10\frac{3}{8}}{32\frac{1}{4}}$		121/8 411/8				12¾ 49¾	1534 54	15 ½ 59	61
Greatest Exp. of Balls Speed of Gov'r Shaft	7 350	380	380	300 300	300 300	10 340	10 340	$\begin{array}{c} 13 \\ 320 \end{array}$	13 320	15 275	$\frac{16^{1}2}{275}$	16½ 275		20 260	$\begin{array}{c} 20 \\ 225 \end{array}$
Dia. Pulley on Gov'r Width of Belt	$\frac{2^{1}_{2}}{1^{1}_{4}}$	$\frac{3\frac{1}{2}}{1\frac{1}{2}}$			4 2	4 2	4 2	5 21/2	5 21/2	21/2	6 3	7 3	7 3	8	8
Dia. Cyl. 300 ft. P'n. Sp. Dia. Cyl. 400 ft. P'n. Sp.	5	7 6	9	10	12 10	14 12	16 14	18 16	20 18	22 20	26 23	31 27	36 31	40 35	45 39
Dia, Cyl. 500 ft, P'n, Sp. Dia, Cyl. 600 ft, P'n, Sp.		412	6	8 7	8	10	12 11	14	16 15	18 16	21 19	24 22	28 25	31 28	35 32

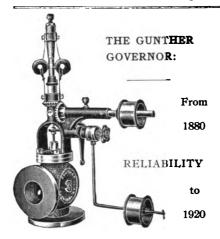
For complete table and for sizes below 11/4—see our general catalogue.

THE WRIGHT MACHINE CO., INC.

ESTABLISHED 1880

OWENSBORO, KENTUCKY

Manufacturers of Engine Governors and Marine Engines



Truly—a Governor that Governs.

260 Manufactured since 1880, thousands have been sold in all parts of the United States and the world.

NEAT

DURABLE

RELIABLE

SENSITIVE

SIMPLE

Best workmanship and materials. Our Engineering Department will design special bodies and make recommendations.

Manufactured from 3/4" to 6" in size. Five different style bodies carried in stock.

Prompt delivery.

Write for literature.

THE WRIGHT RELIABLE HEAVY-DUTY MARINE MOTOR:

A highly perfected Marine Motor that burns kerosene without smoke or odor, developing power exceeding gasoline engines. Sold in all parts of the U. S. and the world. Only the best material but cheapest in the long run—per mile of service.

Write for literature.



Prompt Delivery

Made as follows

Cylinder	Bore and Stroke	R. P. M.	Horse Power
1	6x7½"	450	10
1	716x9"	350	15
2	6x71/4"	450	15 20 30 45
3	6x734"	450	30
3	71/4×9"	350	45
4	6x71/4"	450	40
4	71/4×9"	350	60
6	6x71/4"	450	60
6	716x9"	350	90

THE EVER TIGHT PISTON RING CO.

1600 KINGSLAND AVE., ST. LOUIS, MO.

Manufacturers of Piston Rings

WE ARE PISTON RING ENGINEERS:

Let us advise and assist you with your piston ring problems.

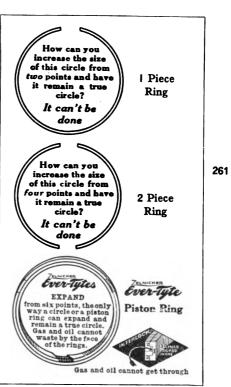
It is a mathematical fact that a circle cannot be expanded or contracted from two points and still remain a perfect circle; neither can a circle be expanded or contracted from four points and still remain a perfect circle, but it can be expanded from six points and maintain a perfect circle, that is, the ratio of the diameter to the circumference increases proportionately. This was first proven by Archimedes, famous Greek philosopher.

The above facts worked out in a practical way produce the ideal piston ring, that is, one which will exert a minimum of wall pressure, causing less wear on the cylinder walls, but at the same time absolutely seal and produce perfect compression within the cylinders.

These features are all incorporated in the Zelnicker Executive Piston Ring. These rings hold first place in piston ring design, and have been used very successfully in steam and internal combustion engines, compressors, pumps, etc.

We have in our file valuable piston ring data and information which is at your disposal.





READ THE GUARANTY BOND:



GREENE, TWEED & CO.

Established 1863

109 DUANE ST., NEW YORK

Manufacturers of Rochester Automatic Lubricators, Palmetto and Manhattan Packings, Wrenches, Belt Fasteners, and Other Mill Supply Specialties

ROCHESTER AUTOMATIC LUBRICA-TORS:

For the lubrication of the cylinders of all types of Steam Engines and Pumps and Air and Ammonia Compressors.



262

Each feed regulated independently. Not affected by temperature, pressure or vacuum.

Working parts are made of steel, and all bearings case-hardened.

All sizes are fully nickel plated.

Equipped with Multiplus Sight Feeds and vacuum and check valves.

The mechanism of the Rochester Automatic Lubricator is compactly centered in a steel pump block, the principal working parts being enclosed and protected from dirt, grit, etc.

This block with all the mechanism can be almost instantly detached and removed, giving easy access to all the working parts for cleaning, repairing, etc., without disturbing the bowl or reservoir attached to the engine.

The Clutch Drive, while positively noiseless, is absolutely positive.

Notwithstanding the fact that the drive is a clutch drive, there is a regulating device whereby more or less lost

motion of the actuating arm can be caused.

The Clutch Drive Rochester is especially adapted for use on high speed engines, having been used with great success on an engine running at 800 r. p. m.

Can be furnished in the regular ratchet drive model if desired.

No expense has been spared in the manufacture of Rochester Automatic Lubricators, efficiency and high quality being our aim rather than low prices.

PRICE LIST

For Stationary and Marine Engines and Pumps

2 Pint Single Feed	30.00
3 Pint Single Feed	35.00
14 Gallon Single Feed	40.00
1 Gallon Single Feed	45.00
2 Pint Double Feed	45.00
3 Pint Double Feed	50.00
1/2 Gallon Double Feed	55.00
1 Gallon Double Feed	60.00
2 Gallon Double Feed	75.00
1/4 Gallon Triple Feed	70.00
1 Gallon Triple Feed	80.00
2 Gallon Triple Feed	90.00
1/4 Gallon Quadruple Feed	90.00
1 Gallon Quadruple Feed	100.00
2 Gallon Quadruple Feed	105.00
2 Gallon Quintuple Feed	120.00
2 Gallon Sextuple Feed	130.00
2 Gallon Septuple Feed	140.00
2 Gallon Octuple Feed	150.00
i -	

For Air Compressors and Ice Machines

	101 III Compressors and 200	
	Pint Double Feed Two-Compartment	\$55.00
1	Gallon Double Feed Two-Compart-	
	ment	65.00
1	Gallon Triple Feed Two-Compart-	
	ment	85.00
1	Gallon Quadruple Feed Two-Com-	
	partment	105.00

SEND FOR DISCOUNT.



HILLS-McCANNA COMPANY

2025 EISTON AVE., CHICAGO, ILLINOIS

Manufacturers of Force Feed Lubricating Pumps



All working parts of the Hills-McCanna Force Feed Lubricating Units are outside the reservoir. The one piece pumps are ratchet driven, operating from a moving part of the engine, and adjustable to any required delivery of oil. Each unit is independent in action and can be discon-

nected, adjusted or removed without effecting the other units. The flash sight feed showing oil delivery is outside the pumping area—right on the line—and is so constructed that back-flow is impossible.

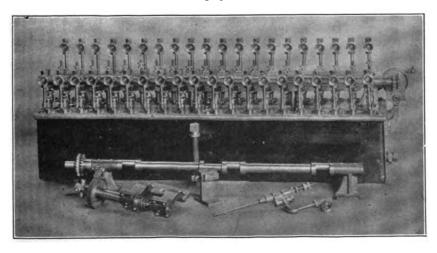
The nickle plated grey iron reservoirs are made in sizes from one pint, single feed to nine gallon, forty feed. Separate compartments for different oils upon request.

A flexible oiling unit of simple, durable construction, positive in action and uneffected by settling dust particles. List price includes everything for operation— 263 no extras required.

Write us today about your lubricating needs.

Catalog upon request. Send for it today.

On the Better Equipment Everywhere



Hills-McCanna Nine-Gallon, Forty-Feed Pump

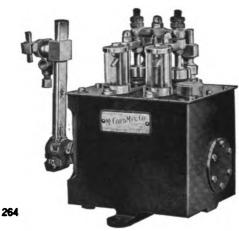
McCORD MANUFACTURING CO., INC.

DETROIT, MICHIGAN

NEW YORK OFFICE 165 Broadway CHICAGO OFFICE Peoples Gas Bldg.

Manufacturers of Force Feed Lubricators, Gaskets, Automobile Radiators

THE "McCORD" FORCE FEED LUBRICATOR:



Class B-Two Feed

It is made in from 1 to 18 feeds and has a separate pump for each feed. Each pump has individual adjustment. It has constant sight feeds which show exactly how much oil is being pumped to each bearing and the flow can be adjusted from one drop to a full stream per stroke.

It is positive and automatic in action and operates in perfect synchronism with the engine or pump it is lubricating. It is not affected by viscosity of oil, variations in steam pressure or length of feed lines.

Note these standard features:

Positive sight feeds without pressure.

Separate pumps capable of individual adjustment for each feed.

Forced delivery of oil against pressure up to 1000 pounds, etc., etc.

Note these special features:

Heating Chamber.

Auxiliary Hand Crank for accelerating feed.

Sturdy operating lever.

Reversible End Bearing.

Plug for draining reservoir.

There is positively no pressure in sight feed; all working parts are of the best drop-forged steel and operate in oil. Rotary or Ratchet drive. Finish—full Nickel Plate or Black Enamel and Brass. Straightaway Spring Check Valves. Heating Chamber and Auxiliary Hand Crank furnished as extras when specified.

ALL PRICES F. O. B. DETROIT

No.	Capacity	Feeds	List
$\overline{1}$	1 Quart	1 Feed	\$25.00
2	1 Quart	2 Feed	30.00
3	2 Quarts	1 Feed	28.00
4	2 Quarts	2 Feed	35.00
5	2 Quarts	3 Feed	42.00
6	2 Quarts	4 Feed	49.00
1 2 3 4 5 6 7	1 Gallon	1 Feed	33.00
8	2 Quarts 2 Quarts 1 Gallon 1 Gallon	2 Feed	39.00
9	1 Gallon	3 Feed	45.00
10	1 Gallon	4 Feed	51.00
11	1 Gallon	5 Feed	57.00
12	1 Gallon	6 Feed	63.00
13	11/2 Gallons	7 Feed	75.00
14	1 1/2 Gallons	8 Feed	82.00
15	11/2 Gallons	9 Feed	90.00
16	1 1/2 Gallons	10 Feed	96.00
17	2 Gallons	11 Feed	108.00
18	2 Gallons	12 Feed	115.00
19	2 Gallons 2 Gallons 2 Gallons	13 Feed	125.00
20	2 Gallons	14 Feed	135.00
60	21/2 Gallons	15 Feed	145.00
61	212 Gallons	16 Feed	155.00
62	214 Gallons	17 Feed	165.00
63	212 Gallons	18 Feed	175.00

DOUBLE COMPARTMENT LUBRICATORS FOR AIR COMPRESSORS AND ICE MACHINES

No.	Cap.	Feed	List
21 22 23 24 25 26		2 Feed 1 Feed in ea. 3 Feed 2 & 1 Feed in ea. 2 Feed in ea. 1 Feed in ea. 3 Feed 2 & 1 Feed in ea. 4 Feed 2 Feed in ea. 2 Feed in ea.	\$44.00 50.00 57.00 47.00 54.00 60.00

For Heating Chamber add \$1.00 to list. For Auxiliary Crank add \$1.00 to list.

See Catalog "I" for Details.

MADISON-KIPP CORPORATION

Established 1898

MADISON, WISCONSIN, U. S. A.

Manufacturer of Fresh Oil Systems and Oil-Kipps



Model 50 Sight Feed Lubricator, Built in Any Number of Feeds. Data on Large Sizes and Special Lubricators Furnished on Request

MADISON-KIPP LUBRICATORS:

	Capacity	Over-All I,ength	H'gt	Width
One Feed Two Feed Three Feed Four Feed Five Feed Six Feed	5 Pints 5 1/2 Pints 5 1/2 Pints 6 Pints 6 Pints 7 Pints	11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	8" 8" 8" 8" 8"	412" 412" 412" 412" 412" 412"

Madison-Kipp Fresh Oil Lubricators are standard equipment for compressors, steam engines, shop machinery, gasoline and oil engines.

More and more engine builders are using Madison-Kipp Lubricators in preference to other kinds.

The development of motor building makes plainer and plainer the Madison-Kipp superiority.

They are better in three outstanding things: First, the Madison-Kipp

valveless; second, the entire mechanism is immersed in oil; and third, the feed 265 adjustments are positive, the plunger stroke never varies, and a full supply of oil is unfailingly drawn in. The deivery is then automatically measured out by the controlled registration of ports in the hollow plunger, sleeve and barrel.

Our catalog gives a complete description of the Kipp Valveless Pumping Principle. If you haven't our catalog in your files, we will gladly supply this upon request.

Our engineering department is at your service to assist in laying out fresh oil lubricating systems for engines.

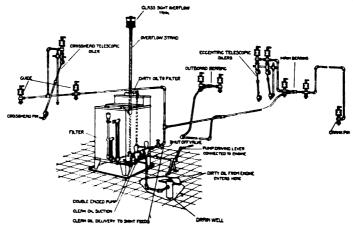
FRESH OIL SYSTEMS

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THE RICHARDSON-PHENIX CO.

126 RESERVOIR AVE., MILWAUKEE, WIS.

Lubrication Engineers and Manufacturers



Typical Installation of an R-P Type "R" Individual Oiling and Filtering System on a Simple Corliss Engine

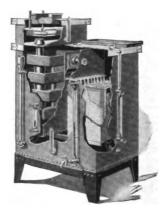
R-P OIL FILTERS AND AUTOMATIC OIL CIRCULATING AND FILTERING SYSTEMS:

The distinguishing features of R-P OIL FILTERS, all of which are essential to an efficient power plant oil filter, are:

- I-Dry System of Filtration. The oil does not pass through water.
- 2—Automatic Water separation and ejector of large capacity.
- 3—Filter cloth is arranged vertically and every square inch effective.
- 4—Multiple Unit design. Each filter unit can be separately removed and easily cleaned without stopping operation of filter.
- 5—Guaranteed to purify used oil so that the lubricating properties of the filtered oil are equal to new oil.

Illustrated and described in detail in Bulletin H-10. Ask for a copy.

R-P OIL CIRCULATING AND FILTERING SYSTEMS use the same oil over and over again. They reduce oil consumption 50% to 90%.



These systems permit flooded lubrication on each bearing, reducing friction so that steam consumption is reduced 2% to 10%.

Entirely automatic in operation. Used oil is collected, purified and pumped back to the bearings in a cool, clean state each time it is used. Insurance against lack of proper lubrication is alone worth their cost. Simple, inexpensive and easily installed.

Write for Bulletin H-25, describing these systems.

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ENGINEERING

THE RICHARDSON-PHENIX CO.

126 RESERVOIR AVE., MILWAUKEE, WIS.

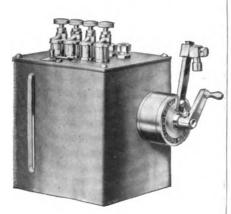
Lubrication Engineers and Manufacturers

THE PHENIX MODEL "T" FORCE FEED LUBRICATOR:

Each oil feed of every Phenix Model "T" Lubricator made is tested to pump against a pressure greater than 2000 lbs. Simple, durable, reliable. Size and frequency of oil drops can be seen in each feed. Each feed in adjustable while lubricator is operating. No gauge or sight feed glasses under pressure.

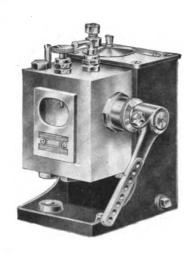
The ratchet wheel is fully enclosed.

The drive is positive, it cannot slip.



Suitable for high speed engines; Steam Pumps; Small Air Compressors; Auxiliary machinery such as Automatic Stokers. Especially desirable on machinery operating intermittently.

THE RICHARDSON MODEL "M" SIGHT FEED OIL PUMP:



267

The pumping plungers of a Richardson Model "M" Sight Feed Oil Pump can be synchronized with the pistons of an engine.

This is the only lubricator made that feeds a small drop of oil to the cylinders at each piston stroke.

Sturdy, simple, it is the most economical lubricator made.

Essential for gas engines; Heavy Oil Engines; Ice Machines; Large Air Compressors, or Any Machinery where timed lubrication is desirable.

Write for Bulletin H-60, describing this different lubricator.

THE BURT MANUFACTURING CO.

30-40 South St., AKRON, OHIO

Manufacturers of Oil Filters, Oiling Systems, Exhaust Heads, Ventilators

THE CROSS OIL FILTER:

What becomes of the lubricating oil continually dripping from the bearings of your machinery? The Burt Mfg. Co. can save from 50 to 90% of that oil for

you, and not only save it but reclaim and purify it for use over and over again. For every dollar you spend for oil you do not reclaim, the Burt oil filter users spend but 25 to 50 cents.



For filtering engine and common machinery oil we make the Cross type of filter. Made for large or

small capacity with or without automatic water separating device. Sizes range from 20 to 200 gallons each 24 hours.

Easily cleaned—no attention required—maintenance cost but a few cents per year for waste—but think of the saving in oil.

THE BURT UNIT OIL FILTER:

Not merely a filter but a complete automatic lubricating system if you so wish. Oil fed to bearings in abundance without fear of waste. Then automatically cleaned, filtered and returned to reservoir. We supply everything but piping. This your engineer or handy man can cut and fit to suit.

Filters in units of 250 to 400 gallons capacity each 24 hours. The y are designed to work independently or in batteries—may be operated in conjunction with a lubricating system or independently of it. As your plant grows so does the Burt filtering sys-

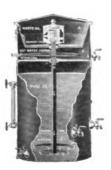


tem keep pace with your growth. When working in batteries a unit may be cut in or out at will. Unexcelled for flexibility and compactness.

Made also in small units of 100 to 150 gallons capacity and in large units "Gary Type" of 1500 to 2000 gallons capacity each 24 hours.

THE AMERICAN OIL FILTER:

Recommended
especially for heavy
oils such as lard, cylinder, crank-case,
etc. Ideal for gas
and gasoline
engines. The
patented hot water
chamber permits
the "American" to
handle heavier oils
than other makes



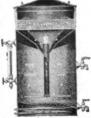
Made in sizes from 5 to 200 gallons capacity each 24 hours.

THE WARDEN OIL FILTER:

This filter appeals to many buyers because of its simplicity. The excellent results obtained by it have brought many duplicate orders from the U. S. Govern-

ment, the British Government and many large industrial plants throughout the world.

Very easily cleaned without interference to the oil supply—any kind pof filtering material may be used.



Made in sizes from 5 to 200 gallons capacity each 24 hours.

OUR GUARANTEE:

Every filter made by us is warranted to be of the best material and workmanship—perfect in every detail. If any customer should find the filter supplied, defective, or in any respect other than it is represented, we will either repair same free of charge or send a new filter.

THE BURT MANUFACTURING CO.

THE BURT VENTILATOR:

If you can give your workmen a vigorous active body, your reward is an

involuntary increase in production. Pure air and an abundance of it will make the active body. The Burt Ventilator will furnish the abundance of fresh pure air.

Other ventilators furnish pure air too? They do provided certain conditions are not existent. Burt Ventilators deliver pure air under all conditions because:



They have a patented sliding sleeve or telescopic damper to regulate but not choke off the air current. Damper can be closed without shutting off the light.

The construction prevents an accumulation of snow or rain, in, about, or on the ventilator in any manner to prevent it from functioning.

They are generously built of good materials and by skilled careful workmen to easily withstand any force or effect produced by the elements.

Made in sizes from 8" to 72" neck.

THE BURT FAN VENTILATOR:

Where conditions demand a rapid

circulation of air but you don't believe the installation of a blower system is warranted, put in a Burt Fan Ventilator. You will find them just as effective and much more economical. They



handle about ten times the volume of air that a plain ventilator does. Fan may be belt driven from your line shaft or direct driven from a 1/4 to 1/4 H. P. motor.

BURT BALL BEARING REVOLVING VENTILATOR:

One of our newest products is the Burt Ball Bearing Revolving Ventilator fully equipped with high grade ball bearings and guaranteed not to stick or bind.

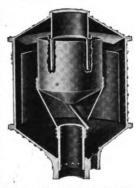


By its construction, air currents pass through it, as well as around and over it, thus increasing its pulling power and making it steadier with the wind.

Made in sizes with 12" to 72" diameter.

THE BURT EXHAUST HEAD:

The Burt Exhaust Head is a profitable investment even if you already have an exhaust head. It actually prevents drenching and disfigurement of the building and the rotof the ting It preroof. vents icy sidewalks caused



by condensed steam. Used in connection with an oil separator it will feed the condensed steam back to your boiler, a regular little condenser and feed water heater.

Constructed with one chamber—large to prevent back pressure. There are no baffle plates or diaphragms. Seams are all tight and waterproof. All exhaust heads painted with an anti-rust paint.

Standard sizes for exhaust pipes from 1'' to 20''. Made to fit any exhaust pipe up to 60''.

We also manufacture the Standard Exhaust Head, cone shaped.

Catalogues or bulletins describing any one or all of these products sent on request. Recommendations and suggestions gladly offered by our engineering staff.

ADAM COOK'S SONS

708-10 Washington St., NEW YORK

Manufacturers of Lubricating Oils and Greases

ALBANY GREASE:

Is a pure lubricant so compounded that it automatically maintains a film of oil between rubbing surfaces, reducing friction losses to a minimum. It contains no adulterants and is guaranteed not to oxidize, gum or corrode the metal of the bearings. Made in different consistencies to meet different temperature conditions.

Comparative tests made by Horace W. Gillett, A.B., Ph.D., at Cornell University of Albany Grease with other well-known lubricating greases using the Thurston and Olsen Machines, showed results which may be summed up as follows:

1st—Greases with a low melting point and with a low content of soap, should theoretically be the most efficient.

2nd—Tallow greases, of which Albany Grease is the best known and most widely used, are the only ones having a low melt-270 ing point and a low soap content.

3rd—Albany Grease (a pure tallow compound) consistently showed its superiority to the other so-called mineral greases, compounded from mineral oil and lime soaps, not only at one pressure on the bearing, but at all pressures.

Albany Grease can be used in any kind or style of grease cup and will not gum, cake or clog, nor corrode.

It is economical because it stays where you put it and does not run or leak away. When the machine is not in operation, Albany Grease does not flow. It will flow just enough to give perfect lubrication—no more. These are facts that you should bear in mind when buying a lubricant.

Albany Grease will show wonderful results on Line Shafting and Loose Pulleys, also on Steam, Gas, Gasoline or Oil Engine Main Shaft Bearings, Crank Pins, Eccentrics and Slides. On special machinery, such as Printing Presses, Shoe Machinery, Coal and Metal Mine Equipment, Sugar Machinery, Cotton, Woolen and Paper Mill Installations, Lumber Camp Machinery, Wood Turning, Sawing Machines and in Steel Mills, it gives the best of service. In fact, no matter what kind of machinery you have, Albany Grease will lubricate it so that it will operate perfectly, keeping it cool and easy

running, and reducing depreciation to the minimum.

Albany Grease is made in seven different consistencies to meet various conditions and temperatures. Use the right consistency for your work and you will have absolutely no trouble.

SOFT NUMBERS (Nos. 0 and 1) for slow running, heavy machinery or where equipment is operated outdoors or low temperature has to be contended with.

MEDIUM NUMBERS (Nos. 2 and 3) for general machinery and shafting; the former is known as a winter grease and the latter as a summer grease. These are the most generally used consistencies.

HARD NUMBERS (Nos. X, XX, XXX) for use in places where the Soft and Medium numbers are not adaptable especially where the temperature surrounding the bearings is high. The No. XXX has the highest melting point with a great lubricating value.



TRADE MARK
Reg. U. S. Pat. Office

Due to the wide publicity given Albany Grease, unscrupulous concerns occasionally substitute inferior goods for our product. When purchasing Albany Grease, insist that our trade mark appears on the package.

We also refine and manufacture, in addition to Albany Grease, lubricating oils and greases to meet all requirements. No matter what your lubricating proposition may be, we can supply your entire wants. We will be glad to send complete data covering the entire lubrication of your equipment and place at your disposal expert engineering service.

THE TEXAS COMPANY

Petroleum and Its Products

Lubricating Oils, Greases, Distillates, Fuel Oils, Asphalt, Roofing, Etc.

HOUSTON: THE TEXAS COMPANY BLDG. NEW YORK: 17 BATTERY PLACE

Offices in Principal Cities

TEXACO LUBRICANTS:

In your plant, Texaco Lubricants and Texaco Service will show the utmost efficiency and economy on engines, turbines, dynamos, motors and machines of all kinds.

The Texaco Line is complete, and includes:

Texaco Cylinder and Engine Oils

Texaco Turbine Oils

Texaco Machine Oils

Texaco Spindle Oils

Texaco Cutting Oils

Texaco Greases

Texaco Motor Oils

Texaco Ice Machine Oils

Texaco Marine Oils

Texaco Steam Railway Oils

Texaco Electric Railway Oils

TEXACO CRATER COMPOUND:

A heavy lubricant for gears and wire ropes. For use on heavy machinery in



shops, mines, hoisting operations, construction work, etc.

TEXACO SERVICE

Users of power and manufacturers of all types of machinery are invited to avail themselves of Texaco Lubrication Engineering Service.

For the power user we are prepared to make a complete inspection of the plant and recommend the proper lubricants for machinery and power units. We are helping many power plants to secure increased operating and production economies.

For the manufacturer of machinery, our force is prepared to prosecute experimental research to determine the most suitable lubricant or lubricants for the machinery produced, with the sole idea of enabling the manufacturer to enhance and maintain the service of his product after it leaves his hands.

We welcome inquiries regarding our products or on any subject relating to the scientific use and application of lubricating oils.

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AKRON METALLIC GASKET CO.

152 N. UNION ST., AKRON, OHIO

Manufacturers of Corrugated Copper Gaskets; Copper Asbestos Gaskets; Akro-Metal Corrugated Gaskets for Superheated Steam; Special Gaskets any Shape or Size of Copper, Lead, Steel, Tin, Aluminum, Monel Metal, Brass, Etc. Gaskets cut from Akronite Sheet Packing



Akron Copper Asbestos Ribbed Gasket with Inner Lap Also Made without Inner Lap

AKRON METALLIC GASKETS:

We make 6 types of Flange Gaskets of metal and of metal and asbestos combination.

272 These gaskets are made to serve different purposes—for all pressures, for saturated, dry and superheated steam, for new, well-aligned pipe work, for compactly built plants, for extra long pipe lines, for poorly aligned piping, for rough flanges.

We are prepared to furnish Akron Metallic Gaskets to meet all requirements.

FULL FACED gaskets punched with Bolt Holes.



Ring Type Gasket Fit Inside Bolts

Gaskets and washers 1/2 inch to 10 ft.

"Akro-Metal" Corrugated Gaskets guaranteed for 5 years on Highest Superheated Steam.

We make:

The "Akron Gunmetal" Gasket.
The "Summit" Copper Asbestos Filled Gasket.



Asbestos Filled

The "Duplex Akron" Copper Gasket.
The Akron Copper Asbestos Ribbed Gasket, in 3 types.



Corrugated Special Shaped Gasket

Regular No. 27 Gauge Copper Gaskets. Regular No. 27 Gauge Steel Gaskets. Manhole Gaskets. Lead Ammonia Gaskets. Special Metal Gaskets.

WE SHIP QUICK AND APPRECIATE YOUR BUSINESS.

When in need of gaskets for any purpose let us quote.

Send for our complete catalogue.

FRANCE PACKING COMPANY

TACONY, PHILADELPHIA, PA.

Branch Offices in All Principal Cities

METALLIC PACKING FOR ALL CON-DITIONS OF SERVICE:

Steam, Gas, Air and Ammonia

France Metal Packing for steam, air, gas or ammonia is made of Vanadium Cast Iron—the best wearing metal known.

For superheated steam on Vertical Engine, Bronze or Bell Metal is used, depending upon the pressure.

The cases are made of cast iron.

The packing is designed for your engine and your conditions. It will last from 5 to 20 years. It is rented or sold on approval.

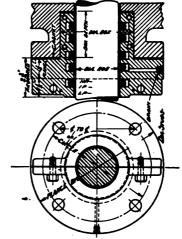
We guarantee satisfaction or expect no pay where the rods are not scored.

What our Steam Packing will pack:

France Metal Packing will pack any round steam, air, gas and gaseous ammonia rod, any pressure, speed or temperature. Any piston rod of any type of engine or pump, whether vertical or horizontal. It will pack any valve stem, whether reciprocating or oscillating.

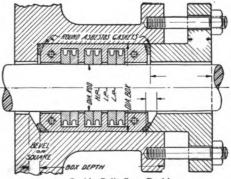
What our Hydraulic Packing will pack:

It will pack any true pump rod, plunger or valve stem pumping any kind of liquid, no matter what the pressure or temperature. Any elevator rod or plunger. Any rod working in liquid.



Marine Type Packing, Split Case

This type of packing is used extensively 273 on vertical and marine engines. It is tapped for carrying off the water that may adhere to the rod, also for lubrication when desired.



Inside Split Case Packing

A very satisfactory packing where the stuffing box will take 1/8 inch packing or larger and where the stuffing box is 31/2" deep or deeper. Outside types furnished where the stuffing box will not admit of this type.

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THE GASKET SUPPLY COMPANY

1740 LUDLOW ST., PHILADELPHIA, PA.

Manufacturers of Gaskets, Packings, Washers, Metal Stampings,
Punches and Dies, Etc.

"RIGHT" GASKETS SAVE MONEY:

Choose the "Right" Gasket for the right place and you will have fewer shut-downs and losses of power, oil, gas, etc. No matter what the service is, we can supply the "Right" Gasket.

We can supply you with gaskets made of the following materials or combinations of these in any size and shape and to meet any conditions or service:

Copper	Leather
Steel	Monel Metal
Brass	Tin
Lead	Zinc
Asbestos	Felt
Rubber	Canvas
Fibre	Wood
Copper Asbestos	Cork
Filled	Paper

No. 50 Copper No. 52 Sheel Abbeelee No. 53 Copper A

















The illustrations show, in cross section, a few of the types of gaskets we furnish. We have the "Right" Gasket for every service—steam, high or low pressure, and superheat; water, cold or hot; oil; air; gas; ammonia; acids; rough or smooth joint.

We make small or large gaskets, orders for 100 inch gaskets being not uncommon in our shops.

"RIGHT" WASHERS:

Washers and strips for grease packings, etc., are made the "Right" way of any of the materials mentioned above.



Complete catalog sent upon request.

GASCO PACKING:

Pack it with "Gasco" and then forget it. A seal of "Gasco" is a seal of dependable service.

Our stock of packing includes:

Asbestos Rubber		Sheets Rings
Leather	in the	Spirals
Flax Canvas	form of	Coils Tucks
Compositions	j	Mill Boards











Made for any service or for any pressure, including:

Steam	Acids	Oil
Water	Brine	Gas
	Ammonia	

Tell us your packing troubles and we will send information and samples.

PUNCHES AND DIES:

We make blanking, forming, bending and embossing dies, and punches for metallic and non-metallic service. We design and make tools and fixtures for all classes of power press work. Send us samples or drawings with quantity wanted and you will be favorably surprised at the quotation we can make you.

STAMPING WORK:

Quantity production lessens the cost per piece and produces a uniform reliable production. We produce on the quantity basis, stampings from all metals and other adaptable materials. We have power and equipment available to exert a pressure of 100 tons. Let us quote you for stamping, forming, shaping, bending, drawing or piercing.

Send for our complete catalog.



GOETZE GASKET AND PACKING CO.

11 ALLEN AVE., NEW BRUNSWICK, N. J.

Manufacturers of Metal Gaskets of Various Types, Metallic Engine Packing, Sheet Packing for Flanges, Valve Gaskets or Discs

PRODUCTS:

Goetze No. 2 elastic corrugated copper gaskets with asbestos lining, also made of steel, aluminum, monel metal, lead, brass, etc.

Goetze valve gaskets or discs for Jenkins, Crane, and similar type valves.

Goetze Special Devo Gaskets corrugated metal with asbestos, non-corroding, covered with Goetze Special Cement.

Goetze Copper Asbestos or Steel Asbestos Gaskets for B & W, Heine, Franklin, Keeler, Edgemoor boilers, etc.



Goetze No. 1 Corrugated Gaskets made of copper, blead, etc. brass, steel, monel metal, aluminum,

Goetzerit Sheet Packing 1/3", 1/16" and 1/3" thick, and Goetzerit Gaskets.

Goetze Metallic Packing.

Goetze products are made to meet the special conditions incident to various industries. It is therefore important that we be advised of condi-

Goetze Gaskets are adaptable for the following uses:

Acid lines Aeroplane motors Air and ammonia compressors Alcohol lines Benzol and toluol stills Boiler domes Boilers, stationary Boilers, marine Chemical lines Coke oven by-product plants Condensed water lines Condenser joints Cylinder heads Diesel engines Distillers Economizers Flanged joints

Handholes Heaters Locomotives Manholes Oil engines Oil, hot or cold Pumps Steam and gas engines Steam chests Steam hammers Steam shovels Steam traps Stills and tanks Submarines Superheaters Tractors Unions Valve bonnets Water tube boilers

GOETZERIT SHEETS AND GASKETS:

Goetzerit is a red asbestos sheet packing for flanged joints—for engineers who prefer to cut their own gaskets from the sheet rather than to use a metallic gasket or metal-asbestos combina-

Goetzerit is easily the best sheet packing for such use, because it is made from pure, prime asbestos fiber, compressed under an exceedingly high pressure and impregnated with a substance which makes it proof against the action of super-

at the highest pres-Sures now used Never mind

mind an unfortunate experience you may have had with as-hestos sheets—"Go to Goetzerit and You'll get the Goods." Specify "Goetzerit" for



stea m, air, am-monia, acids, oil, petroleum, etc. Goetzte No. 2 Elastic Gasket is a very superior Goetzte No. 2 Elastic Gasket is a very superior gasket, made from chemically pure copper and the best of asbestos. In other words it is a Copper - Asbestos Gasket, though quite unlike and better than most gaskets so named. The copper is corrugated and closely twisted asbestos is held in the corrugation as shown in the cut. The Gasket that holds tight against extremes of pressure and temperature and superheated or saturated steam. The Gasket that costs least by the year. The Gasket that's free if it fails. The Gasket that you may try for 90 days, under any conditions. That's Goetze No. 2—The Dependable—A Goetze Ros. 2—The Dependable—A Goetze Sasket—A product of long experience and unusual facilities. Try the mout in your "Trouble Spots." Look for the Red Label with white letters, reading "Goetze No. 2 Elastic." GOETZE VALVE GASKETS OR DISCS:

For valves of jenkins type are made of copper and asbestos. They're resilient—full of "comeback"—always ready for business. They furnish a cushion for the valve seats which will

yield just enough to make a tight joint, but which will not crumble nor deteriorate, not in-jure the valve slightest de-

gree.

If you are not yet using Goetze Valve Gaskets, send sample order, large or small, on 90 days' trial. They don't cost you a cent unless they good.





THE MARTELL PACKINGS CO.

ELYRIA, OHIO

Manufacturers of Martell Metallic Packings

This Information is Important to Users of Metal Packing

Figure 1: Shows cut of Martell Packing Ring enclosed in cages of suitable design, two forms of same being shown on this sheet (Figs. 1 and 2). This and 2). ring floats



Fig. I

freely and easily with the rod and being made of cast iron or bronze, soon acquires a hard glaze which reduces wear and friction to a minimum. No difficulty will be experienced in any form of packing in securing an effective seal between the bore of ring and piston rod; hence, the problem of making a contractable steamtight ring centers in the efficiency of the joints between the component parts of said ring and the design must be such 276 that these points remain in effective contact regardless of the conditions of service. The ring here shown is designed with these joints parallel one to the other so that when unequal wear causes one segment to move toward the center more rapidly than others, no disarrangement of joints will result. Were these joints not parallel, any inward movement of one segment (caused by the top segment wearing more rapidly) must result in corresponding movement of all, or joints will not remain in contact; hence, this ring is made with joints parallel.

Figure 2: Shows a case for Martell Rings designed to be placed in the stuffing box of an engine arranged for ordinary fibrous packing. This is more quickly and easily applied than the



Fig. 2

usual number of rings of fibrous packing, and as it uses the hard metal rings described above, once placed, it is practi-An important cally there for all time. feature is the method used to insure the proper alignment of the two halves. In this instance, this is accomplished by ferrules which are firmly driven into the screw hole in one side of the case and make a snug fit in the hole in the other half. This gives all the advantage of a reamed hole and fitted bolt, on account of the lack of space. This case is fitted with a copper wire gasket inlaid in the end and making a contact with bottom of stuffing box and is recessed, as shown, so that the compression caused by the gland is taken by a line of metal of unbroken continuity; hence, there is no tendency to collapse the case or pinch the rings.

Figure 3: Shows an outside case for an engine. This is bolted direct to cylinder head when engine is designed without stuffing



Fig. 3

box, or outside of box when too small for use of case as per Fig. 2. This is split and the two halves are held together with the through bolts shown, making a very rigid construction. A light, flexible wearing ring in a heavy rigid container is the foundation of success in Metal Packings, this being in harmony with the mechanical principle, which requires moving parts to be light, stationary parts to be heavy.

Figure 4: Shows an inside form of packing to be used in small stuffing boxes and where conditions do not warrant the use of higher grade packings. Each of the concave and convex rings here shown are in halves and the halves of the con-

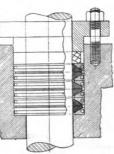


Fig. 4

cave rings are held together with coil springs filling groove in outer periphery, hence the packing can be applied with ease and certainty. We sell quantities of this packing for plungers, stop valves, throttle valves, slip joints, etc.

If you are interested in metallic packing of any kind we have it. Let us send you our catalog, our Engineering Department is at your service. Let us help you. Send for our Catalog.

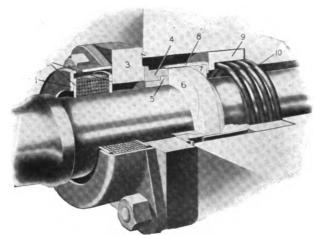
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THE UNITED STATES METALLIC PACKING CO.

429 N. 13TH ST., PHILADELPHIA, PA.

BRANCH OFFICES: NEW YORK AND CHICAGO

Manufacturers of Metallic Packings for Locomotive, Marine and Stationary Engine Piston Rods and Valve Stems; also other Locomotive Appliances



King Piston Rod Packing

KING PACKING:

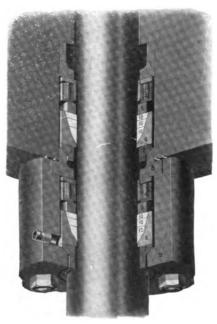
For locomotive piston rods, valve stems and air pumps has demonstrated its simplicity, efficiency and economy on a majority of the locomotives in the country. Designed and manufactured in a manner to meet the extreme requirements of modern railway service.

CLASS NO. I PACKING:

Used in a majority of cases by us for packing marine and stationary engines.

We manufacture other designs of metallic packings for marine and stationary service, varying the design to suit the requirements.

Send for catalog describing these packings and other products.



Class No. I Packing

THE AMERICAN METAL HOSE CO.

WATERBURY, CONN.

Manufacturers of Flexible Metal Hose and Tubing



AMERICAN METAL HOSE is exactly what the name would imply—a Hose made of metal.

Long association has so intimately connected "Hose" with Rubber, that the mention of Hose will often convey only a "Hose made of Rubber."

This is not surprising for Rubber Hose dates back over half a century. In certain light duties such as conveying

Air and Water at low pressures, there is even today nothing better obtainable than Rubber Hose.

Rubber Hose, though, never was and never will be suitable for any real heavy work. The high steam pressures used in modern engineering, and the almost universal use of Oils call for something more durable and efficient. Metal Hose fills this demand to perfection. It is a high pressure, hard service proposition fully capable of meeting any reasonable demands; just glance at these comparisons:

Rubber Hose: Made from a vegetable compound which rapidly deteriorates under the action of Oils, Alkalies, and the intense heat of Steam; frequent replacements and unsatisfactory service.

Metal Hose: Formed from the toughest Phosphor Bronze or Special Heavy Galvanized Steel; affected in no way by the highest temperatures or the chemical action of Oils; a Hose that is both enduring and economical.

The accompanying illustration shows the construction of our Standard Hose for conveying Steam and Oils. This Hose (our BD15) from its very nature is a high pressure Hose, possessing great strength and flexibility. In addition to our BD15 Hose we are making several other patterns of Metal Hose suitable for a wide variety of services.

We specialize on Hose for the most severe duties; Metal Hose for steam in all connections; for Oils; for Acids; for Greases; for Fats; and for Alkalies. Flexible Metal Tubing for Exhaust; and Vacuum and Flexible Metal Conduit in a number of patterns for an endless range of applications.

We have had twelve years' experience in the manufacturing of Flexible Metal Hose and are justly proud of the quality of our products.

We can help you solve any of your Hose problems.



THE B. F. GOODRICH RUBBER CO.

AKRON, OHIO

Offices in All Principal Cities

Manufacturers of Mechanical Rubber Goods, Tires, Etc.

HOSE:

Goodrich Hose is made to meet every conceivable need for hose in Industry. Goodrich has been making Hose for fifty years, and gaining reputation each succeeding year.

Water Hose is made in a wide range for every purpose.

"COMMANDER" is of the highest grade for unusual and heavy conditions of service.

"TRITON," "CASCADE," "DELUGE" are regular grades for all general purposes.

"AKRON" and "JUPITER" are braided fabric water hose made in any length up to 500 feet.

Steam Hose. Heavily constructed to withstand high pressure, and in all cases the inner lining specially prepared to withstand the action of steam under varying temperatures.

"SUPERHEAT" for unusual and most severe service conditions is constructed in every detail for gruelling conditions.

"GOODRICH," for high pressure steam and long life as well.

Pneumatic Hose. Wrapped duck in lengths of 50 feet.

"GOODRICH," the highest quality for hardest service.

"AKRON," the standard wrapped hose for all general purposes.

"COMMANDER," "MAINSTAY" and "MAXECON" braided pneumatic hose made in any length up to 500 feet.

Air Drill Hose. "GOODRICH" braided, and "QUARRY" wrapped, both unequalled for hard wear.

Boiler Washout Hose is made with special attention to the hard usage that hose always receives when used for this purpose. Several grades of proven quality are made.

Suction Hose is made in various grades, either smooth or rough bore, to suit any service. DREDGING SLEEVES, OIL SUCTION HOSE, OIL-WELL DRILLERS' HOSE, OIL CONDUCTING HOSE, GASOLINE HOSE, SAND BLAST HOSE, COKE HOSE, DECK HOSE, etc., and any hose for any purpose—Goodrich makes it.

PACKING:

"Superheat" Packing. A combination of rubber and specially selected long fiber asbestos. "Superheat" is a necessity where high pressures and temperatures are encountered.

"RED SHEET PACKING" with brass wire insertion. "DIAPHRAGM and CLOTH INSERTION," "RED TUBULAR GASKET PACKING," "SPIRAL SQUARE DUCK PACKING," "ROUND" and "SQUARE" Duck Packing, "SQUARE RUBBER BACK PISTON PACKING," "PURE GUM STRIPS."

GASKETS:

"RED SHEET GASKETS" and "SUPERHEAT" SHEET GASKETS.

GOODRICH RUBBER PUMP VALVES: 279

There is no class of our products that we take greater pride in stamping with our trademark than these. Our list of grades is complete, and we are glad at all times to give special attention to unusual conditions and sizes. Made in grey or red rubber.

MOLDED RUBBER GOODS:

We have a large Department devoted exclusively to the manufacture of molded rubber articles of every description: Diaphragms, Bumpers, Springs, Cushions, Tips, Balls, Billiard Cushions, Respirators, Rubber Mallets, Soles and Heels, Parts for Automobiles, Truck Wheel Tires, Discs for Steam and Radiator Valves, special articles used in connection with the Oil Industry, Sugar Factories, Creameries, Breweries, Laundries, Rubber parts for Plumbing devices, Carpet Sweepers, Vacuum Cleaners, etc. A large part of this class of our business lies in the direction of strictly special articles made to customers' specifications. Our products are uniform in their good quality and excellent finish.

(See page 390 for additional products of this Company)

OUAKER CITY RUBBER COMPANY

PHILADELPHIA, PA.

BRANCHES:

CHICAGO

PITTSBURGH

NEW YORK

Manufacturers of High Grade Rubber Belting, Hose, Packings, Mechanical Rubber Goods, Automobile Tires and Tubes

BELTING-TRANSMISSION:

Made in several grades to meet various working conditions. IRONSIDES is a frictioned surface belt in a class of its own, being the ultimate in belt quality. For main drive and severe conditions.

QUAKER CITY:

A superior belt, rubber covered, with heavy duck and strong friction, for general purposes.

CROWN:

A strictly high grade belt. For use where conditions are not extraordinarily severe this belt will give entire satisfaction.

BELTING-CONVEYOR:

280

For the conveying of ore, sand, gravel, stone, coal, grain. Conveyor Belting can be furnished on short notice for any purpose, any length, width or thickness desired.

DESERT is our leader in the conveying field and is designed especially to meet hard conditions.

CROWN is for general service and HERCULES is a thoroughly good belt for the lighter class of conveying duty.

ROD PACKING:

Daniel's P. P. P. is unquestionably the finest rod packing. Unequalled for the packing against steam, water, air, ammonia and other fluids on engine, pump and compressor rods, etc.

SHEET PACKING:

EBONITE has been found to be the most serviceable packing for high pressures, superheated steam, hot water, ammonia, oils, acids and all other kinds of joints requiring packing.





Reg. U. S. Pat. Off.

HOSE:

We manufacture rubber hose for every purpose. Each grade and brand is made with special care to render the best service for which it is intended.

STEAM HOSE:

EBONITE for high pressures and high temperatures, made with tube of same composition as our celebrated Ebonite Sheet Packing and strong, tough cover. We warrant EBONITE to be the equal or superior of any hose for steam purposes.

QUAKER CITY AND CROWN:

Well made and will give good results for moderate or low pressures.

WATER HOSE:

QUAKER CITY our first grade. Distinctly a quality hose. Recommended for hard duty.

CROWN: Will give excellent service and stand high pressures.

HERCULES: For medium grade work this hose cannot be equalled.

AIR DRILL HOSE:

AERO and GIRARD are made to satisfy a demand for a light weight hose, yet capable of standing high pressure and severe usage of mining work.

PNEUMATIC TOOL HOSE:

RINGMETER and YANKEE in braided moulded continuous length up to 500 feet.

EBONITE:

Wrapped construction in 50 ft. sections.

BOILER WASHOUT, FIRE, ACID, COKE, CHEMICAL, OIL SUCTION and DISCHARGE, OIL DRILL, GASOLINE SUCTION, SAND BLAST, etc.

PUMP VALVES:

Valves for hot or cold water, ammonia, acids, oils, air condensers, blowing engines, boiler feed-water pumps, mine pumps, marine pumps, air pumps, etc.

Gaskets, Moulded Goods, Tubing, Mats and Matting, Diaphragms, Washers and complete line of Mechanical Rubber Goods.

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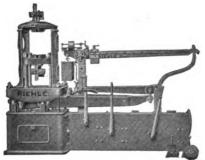
RIEHLÉ BROS. TESTING MACHINE CO.

1424 North 9th Street, PHILADELPHIA, PA.

Manufacturers of Testing Machines and Testing Appliances

RIEHLÉ TESTING MACHINES:

Are used by the leading Colleges, Steel and Iron Works, United States Government, many foreign Governments, and are recommended by many of the most prominent and successful Engineers throughout the world. We design and build these machines from 5000 lbs. to 2,000,000 lbs. and over in capacity for the determination of any physical property.



Riehlé U. S. Standard Vertical Screw-Power Testing Machine. Three-Screw Type, 100,000 Lbs. Capacity

Features of Riehlé Testing Machines:

Designed Right.
Plenty Strong Enough.
No Sparing of Material.
Long Base Lines.
Simple in Construction.

All parts Accessible, without taking whole machine apart.

Fine Finish. Attractive in Appearance.

NOTE:

We are now building all the Riehlé Vertical Screw Power-Testing Machines with two (2), three (3), or four (4) Main Pulling Screws as may be desired.

For quick and convenient reference our complete line of Testing Machines is catalogued as enumerated below:

RIEHLÉ TESTING MACHINE CATALOGUE "A:"

Illustrating and describing all the large Riehlé U. S. Standard Testing Machines, Screw and Hydraulic Power, also new and ingenious tools for same; Machines for Long Transverse Members, Torsional and Impact Testing, also Calibrating Levers.

RIEHLÉ CATALOGUE "AA" OF EXTENSOMETERS, COMPRESSOMETERS, AND TORSION METERS:

Containing illustrations and descriptions of the very latest and best Riehlé Extensometers.

RIEHLÉ TESTING MACHINE CATALOGUE "B:"

Embracing all the various styles of Riehlé U. S. Standard Testers for Wire, Cloth, Canvas, Cord, Twine and Textile Fabrics of all kinds, also for every variety of test. This catalogue is well worth your careful perusal.

RIEHLÉ CHAIN TESTING MACHINE CATALOGUE "C:"

In this Catalogue is found all that is newest and best in Testing Machinery for Chain, Wire, Hemp, Rope, Bye-Bars, Bridge Irons, etc. Special Machines for different forms of materials can be designed along these lines. We also furnish Hydraulic Pumps separately if desired. We claim these Machines are the Strongest and Best in the World.

RIEHLE TESTING MACHINE CATALOGUE

Containing illustrations of Transverse Bending and Special Testing Machines, Rope Twisters, Loam Mills, Pipe Provers, etc. Every Foundry and Machine Shop should install some of the articles shown in this Catalogue.

RIEHLÉ TESTING MACHINE CATALOGUE "E:"

Those interested in Springs of all kinds, also Oils and Bearing Metals, are especially referred to this Catalogue for all the newest and best Machines.

RIBHLÉ CATALOGUE "F:"

In this Catalogue are presented illustrations and descriptions of superior designs and patterns of Hand and Power Hydraulic Pumps and Presses, also Riehlé-Robie Patented Screw Jacks, etc.

RIEHLÉ CEMENT-TESTING MACHINE CATALOGUE "G:"

In this Catalogue one will find "everything that is good" in the way of testing Cements, Asphalts, Building Material, and also every conceivable article for thoroughly equipping a Physical Testing Laboratory for that kind of work. Be sure and send for this Catalogue.

RIEHLÉ ROAD MATERIALS TESTING MA-CHINE CATALOGUE "K-1:"

In this Catalogue you will find illustrations of everything to make tests of Road Materials, as used by the United States Government, Department of Public Roads, Washington, D. C.

Select the Catalogues you want when ready to order.

We are the oldest and largest Testing Machine manufacturers in the United States. Established 55 years ago.

TINIUS OLSEN TESTING MACHINE CO.

500 North 12th St., PHILADELPHIA, PA.

Manufacturers of Testing Machines and Instruments

PRODUCTS:

Testing Machinery and Instruments for determining the physical characteristics of all material. Universal Testing Machines, Special Testing Machines for Hardness, Torsion, Impact, Bending and Alternate Stress Testing. Special Testing Machines for Cement, Concrete, Fabric, Cloth, Twine, Paper, Leather, Oils, Grease and Bearing Metal. Also Testing Machines for moulded insulating material, springs, wire, rope, chain, anchors, iron, steel, road materials, etc. Special Efficiency testing machines for determining the property of all tools. Special Milling Machines, Pumps, Viscosimeters, Presses, Accumulators, etc.

OLSEN CATALOGUES:

We build several hundred types and sizes of Testing Machines applying to almost every conceivable class of material and have classified these machines according to their similarity and use in our catalogues and bulletins, as follows:

284 Part "A"—Universal Testing Machines and Instruments.

Part "B"-Spring Testing Machines and Spring Machinery.

Part "C"—Cement, Concrete, and Road Materials, Testing Machines.

Part "D"—Cloth, Yarn, Paper, Leather and Rubber Testing Machinery.

Part "B"—Wire, Rope, Chain, and Anchor Testing Machinery.

Part "F"—Oil, Grease and Bearing Metal Testing Machinery. Part "G"—Transverse and Beam Testing Ma-chinery, Foundry Testing Machines.

Part "H"—Special Testing Machines.

Part "H"—Special Testing Machines, including Impact Abrasion, Vibratory, Bending, Hardness, Endurance, Torsion, Alternate Stress and Efficiency Testing Machines.

Bulletin No. I-OLSEN Hydraulic Brinell Hardness Tester.

Bulletin No. 2—Rubber, Fabric, Oil, Grease, and Special Testing Machines.

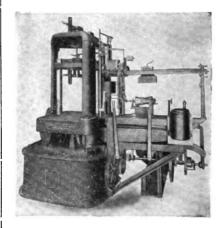
Any of the above catalogues or bulletins will be mailed upon request.

TESTING LABORATORY—Research Department:

We have a completely equipped Testing Laboratory and Research Department in which we are prepared to make all kinds of tests and investigations and develop new methods of testing and suitable machines for the purpose.

Special problems requiring the development of new methods of testing and new designs of Testing Machines are placed in the hands of expert Engineers who are trained in this class of work.

Olsen Universal Testing Machines:



Olsen New Automatic and Autographic Universal Testing Machine

These machines are built in several types, and many degrees of completeness, and in sizes ranging from 10,000 lbs. to 1,500,000 lbs. to meet almost any and every requirement.

Testing machine as shown is an illustration of our most complete up-to-date machine, used by all the large well-equipped metallurgical and Automobile Testing Laboratories.

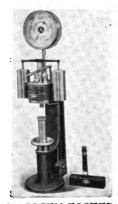
Olsen Torsion Testing Machines:



230,000 Inch Lbs. Capacity OLSEN Autographic Torsion Testing Machine

This size machine is in use by all the large Automobile Manufacturers. Such machines are made in many sizes varying from that testing a small wire, to that of 2,000,000 inch lbs. capacity.

TINIUS OLSEN TESTING MACHINE CO.



Olsen Hardness Testing Machines for applying Brinell Test:

These machines are built invarious types and sizes, so as to meet all requirements.

Alternate Stress Impact and Special Testing Machines:

We build all the latest up-to-date Special Testing Machines such as

the OLSEN-FOSTER Alternate Torsion Testing Machine, Upton-Lewis Toughness and Endurance Testing Machines, McAdam Impact Shear Testing Machine, Olsen Impact Tension Testing Machines, Turner Impact Tester, Matsamura Repeated Impact Tester, Norris Abrasion Testing Machine, also the Flowers and the Hayes-Lewis type of Viscosimeters.

OLSEN UNIVERSAL EFFICIENCY TESTING MACHINE:

The advancement in the art of making high-speed cutting steel and the ever-increasing use of special cutting tools of such steel have necessitated the development of special efficiency testing machines, for determining their cutting quality.

It has been determined that various tool steels should be operated at a definite speed for maximum efficiency depending edges may cause a variation of several hundred per cent. in production.

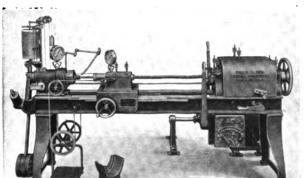
It is essential, therefore, that all such tools be tested thoroughly and for this purpose the above machine was developed.

This Testing Machine was developed primarily to test the cutting properties of drills, taps and dies, as well as the cutting compounds, etc., and attachments have been developed and added whereby the cutting properties of files, hack-saw blades, and milling cutters may be tested by our spot and single-tooth method, which will not in any way materially damage any of these tools and thus provide not only a quality test, but a proof test as well.

Special attachments have also been developed for testing cutting property of tool steel, and, by reversing the process and using a standard tool, the cutting value of any steel or metal.

To successfully obtain data for the above tests a very wide range of both speeds and feeds must be obtainable and means whereby pressure can be weighed and noted instantaneously at point of application during any test and means provided whereby the relation between torque and revolutions or penetration may be graphically recorded, thereby showing the complete cutting characteristics of the tool under test.

This efficiency testing machine as here illustrated is arranged with a variable speed direct-connected motor drive, so that spindle speeds of from 50 to 1,000 R. P. M. may be obtained.



on their treatment and the material they are to cut. The shape of such tools are of the utmost importance, as slight

variations in angle or clearance of cutting

The feed may be applied either by gravity under a known load accurately weighed or positively through quick change gearing in a geometric ratio from 0.0025 to 0.04 inch per revolution.

The Testing Machine as here illustrated is of our No. 1 type in that it will test drills up to one inch in diameter on this machine, but we are in a position to supply these machines in larger sizes to meet specifications.

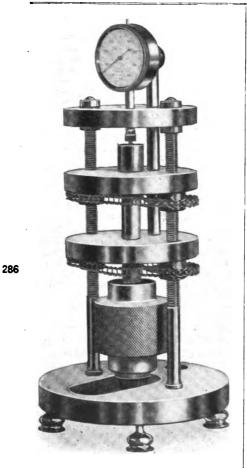
This efficiency testing machine is fully described in our catalogue part "H" and full details will be mailed upon request.

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THE PUSEY AND JONES COMPANY

WILMINGTON, DELAWARE, U. S. A.

Engineers and Manufacturers of Pulp and Paper Making Machinery, Marine Equipment, Chemical Apparatus, etc.



THE PLASTOMETER:

The plastometer measures and indicates the degree of hardness or density or of plasticity of rubber, leather, fibre or any other resilient material. The degree of hardness or density is found by measuring the depth of the depression produced by the weight of one kilogram on a ball 1/8" diameter or for softer substances a ball 1/4" diameter.

Any material may therefore be standardized as to its hardness or density or plasticity.

For example, most of the rubber manufacturers have installed plastometers. In ordering new rubber or in ordering for duplication, the degree of hardness or density may be specified by including in the order the words—Plastometer reading 60 to 70 with the 1/8" ball. A commercial tolerance of five points above and five points below the desired reading is recommended. Thus may be given directions understood by the manufacturer while the buyer's plastometer also enables him to check up on receipt of the goods.

The plastometer is furnished in a portable mahogany case, with directions for use attached to the lid of the case.

The price is \$150.00.

AMERICAN KRON SCALE CO.

430 E. 53RD ST. (Dept. B), NEW YORK

Branch Offices and Service Stations in Principal Cities

Manufacturers of the Kron Automatic Springless Dial Scale



Above is an illustration of one of our Crane Scales in service in the plant of a prominent steel and iron company

THE KRON SCALE:

Automatic—Springless

"LOAD AND LOOK"

The Kron Scale is an automatic weighing indicator for light and heavy work. All parts interchangeable regardless of capacity. Entirely free from springs. All metal construction. It seals itself.

Made in U.S. A.

Advantages of the Kron Scale:

Where rapid and accurate weighing is desired the Kron scale should be installed.

The Kron is Automatic. It is the only scale that will indicate the total load on the dial without any manipulation of extra weight or sliding poises.

The Kron is Non-Vibrating—the pointer always stops "dead" at accurate weight.

The Kron is Highly Sensitive—but it is not delicate and parts can be replaced within a very few minutes.

The Kron is Strongly Built upon a Proven Principle—hence its maintenance cost is practically nil.

Types of the Kron Scale:

Among types made with small or large capacity are:

Dormant Types
Portable Types
Crane Types
Conveyor Types
Hopper Types
Larry Car Types
Overhead Types
Other types can be furnished.

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RICHARDSON SCALE COMPANY

PASSAIC, N. J.

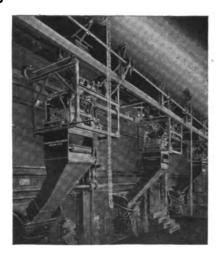
Branches in all large cities

Automatic Scales for Weighing All Kinds of Crushed, Granular, Lumpy and Powdered Materials; also Scales for Weighing Liquids

RICHARDSON AUTOMATIC BOILER SCALE:

Like all Richardson Automatics, the Boiler Scale is built on the equal balance principle. Suppended on the opposite ends of an equal arm beam balanced in the center are a hopper and a weight box that exactly balance each other when empty. When the weight of material in the hopper equals the weights in the weight box, the beam comes to a balance, simultaneously cutting off the stream above and opening the hopper door causing the scale to discharge.

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Three Richardson Automatic 100-lb. Boiler Scales Installed at the Plant of Philadelphia & West Chester Traction Co., Llanerch, Pa.

Richardson Automatic Boiler Scales weigh coal as it is fed to each individual fire and record the weights on individual engine counters. They receive, weigh and discharge from bunker to boiler without HUMAN ASSISTANCE.

On an average the cost of coal is 60% of Steam Power Plant expense. The vital problem confronting the power plant operator today is to keep track of what his boilers are doing and to maintain them at all times at their best efficiency. Coal, the principal steam power plant expense, is the easiest item to save on.

The automatic counter substitutes mechanical accuracy for man-made errors in compiling the records of coal consumed. After all, your firemen are firemen and not well-paid accountants and it is not fair to expect them to compile records and always get them right.

Richardson Automatic Coal Scales can be installed wherever overhead bunkers afford a gravity feed or wherever it is possible to elevate the coal in storage above the scale. If your coal will leave the bunker, the scales will automatically receive, weigh and positively discharge it to the stoker hopper or boiler room floor without hold-up. Their rugged construction is a guarantee against breakdowns. The accuracy is within 1/2 of 1%. These scales are built to weigh coal and nothing but coal and the ordinary foreign matter found in it. They represent years of experience and research.

The reading of the counter compared with boiler output shows actual efficiency. A comparison of the readings for the different boilers shows relative efficiency. Wasteful firing, dirty boiler tubes, scale and improper draft are instantly detected.

WILLCOX ENGINEERING CO.

SAGINAW, MICHIGAN

Manufacturers of Water Weighers



WILLCOX AUTOMATIC WATER WEIGHER (Patented):

Rectangular type with storage tank forming the base of the weigher, and automatic control of inlet supply to the weigher. Service: Takes water from any source, such

as a feed-water heater, tank, pump or hydrant, at any rate of flow or at varying rates, and delivers it intermittently in accurately weighed unit charges

Weighs hot feed-water from an open heater, cold water from a hydrant, water of condensation from vacuum pans or heating systems, also chemicals, caustic solutions, volatile oils, sugar juices, etc.

juices, etc.

Operation: The charge is weighed by a liquid column of fixed height, through the medium of an air balance. The unit charge is dumped automatically by the sudden release of the entrapped air—an extremely accurate and reliable method of balancing.

All Parts Accessible: The weigher is constructed so that every part is easily accessible and the bell float and other operating parts can be taken out of the machine and replaced without

be taken out of the machine and replaced without be taken out of the machine and replaced without disturbing the setting of the machine, or breaking any packed joints. The machine is so constructed that its entire cycle of operations can be seen while the machine is working. Dirt and scale within any reasonable amount will not affect its accuracy or its operation, and it can be easily cleaned.

Only One Moving Part: There is practically no friction, there being only one moving part in the machine, namely, the bell float with its attached stand pipe. This part has a floating movement up and down of about one inch at each weighing.

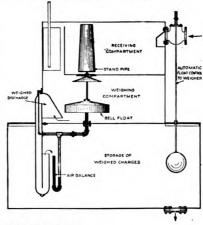
Accuracy: Maximum per cent. of inaccuracy of the weigher at all loads from one-tenth of its

maximum capacity up to said maximum, one per cent. by weight; the average weight of any ten consecutive unit charges being compared with the average weight of any other ten unit charges.

capacities: Made in capacities from five thousand pounds to five hundred thousand pounds per hour to suit various requirements; portable weighers for evaporative and condensing tests; and power-plant sets for permanent installation.

Storage Tank and Float Control: Willcox Engineering Co. will furnish a storage tank, forming the base of the weigher as illustrated, and fitted with a balance-pressure valve on the inlet to the weigher, the balance-valve being controlled by a float in the storage tank, thereby automatically resultating the frequency of the automatically regulating the frequency of the weighings according to the varying demands weighings according to the varying demands of the plant, and automatically maintaining an approximately uniform level in the storage tank. Where the weighed charges can be delivered from the weigher direct into a sump or tank already available at the plant, the storage tank illustrated can be omitted. Weigher can be furnished with or without the storage tank and balance-valve as desired.

Diagram Recorder: Draws a diagram showing at a glance the variations in rate of supply during a test. A valuable check for boiler trials and condensation tests. The Diagram Recorder Attachment can be furnished for any size or style of weigher, and with either a twelve-hour or a street four beautiful property. twenty-four-hour clock, and arranged to operate either by mechanical connection to the weigher as illustrated, or electrically, at a distance from the weigher, as desired. Diagram Recorders the weigher, as desired. Diagra are furnished on special order only.



CONSTRUCTION:

Weigher Shell: Built of tank steel with

weigner Snell: Built of tank steel with seams welded.
Fittings: Cast brass and vanadium steel; bell float and stand pipe made of heavy sheet brass.
Register: White dial indicating through a glass cover. Each weighed charge is indicated as delivered.

Heavy Steel Inlet Screen: On inlet to weigher to prevent entrance of pieces of scale or foreign matter.

JOHN SIMMONS CO.

119 CENTER ST., NEW YORK, U. S. A.

Steam and Mechanical Specialties

LEINERT AUTOMATIC GRAVITY SCALES:

For Measuring by Actual Weight

WATER-OIL-SUGAR-JUICE-SPIRITS-PETROLEUM—AMMONIA—BRINE—CHEMICALS AND LIQUIDS OF ALL DESCRIPTIONS

Simple: Accurate: Reliable

NOT AFFECTED BY TEMPERATURE PRACTICALLY NO WEARING PARTS

The Pre-eminent Meter for Power House Service



290

Types: At the present time these machines are made in ten standard sizes with charge capacities (*i. e.*, contents of single bucket) from 10 lbs. in the smallest No. 1 machine up to 2,000 lbs. The nor-

mal capacities per hour in the table are based on a conservative speed of one discharge (one tilt of the bucket) per minute.

The Type "A" machines have for inlet mechanism a three-way cylindrical valve and are suitable for all liquids with the exception of very sticky ones for which Type "C" machines having as inlet an oscillating trough, called deflector, should be preferred.

For measuring hot water or liquids emanating obnoxious gases the machines must be enclosed in a casing Type "AE" and Type "CE" machines.

The Type "B" machines in which the measuring buckets tilt under a reduced feeding stream make it possible to obtain, in a simple way, the highest degree of accuracy in the automatic weighing of liquids.

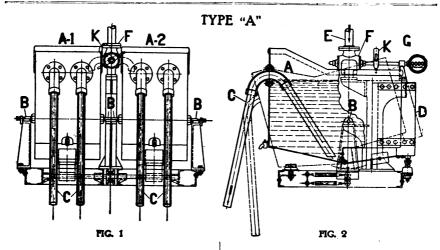
Durability: All parts being easily accessible can be cleaned whenever necessary, even during operation. The measuring tanks and other parts in contact with liquid can be made of the best resisting material and are not otherwise subjected to serious wear.

Accuracy: These machines being a modified form of a one-lever balance with a single pair of knife edges, when once in operation, being free from human errors, obviously give in industrial practice an accuracy far superior to that obtained by hand weighing on commercial scales. Type "A" and Type "C" machines have an accuracy of less than one-half of 1 per cent., while Type "B" machines possess a correspondingly higher accuracy

LEINERT AUTOMATIC LIQUID SCALES TYPE "A"

SIZE NO.	NORM. CA Water, P	APPROXIMATE NORM. CAPACITIES Water, Petroleum, Milk, Etc. CAPACITY PIPE APPROXIMATE DIMENSIONS APPROXIMATE DIMENSIONS APPROXIMATE DIMENSIONS						
s.	U. S.Gals. per Min.	Lbs. per Hour	OF TANK		Length	Width	Height	Base to End Siphon
1 3 4 5 6 8 9	1.1 7½ 12 30 60 120 180 240	600 3600 6000 15000 30000 60000 90000 120000	10 60 100 250 500 1000 1500 2000	1/2" 1/2" 2/2" 2/2" 3/2" 3/2" 4/2"	1'-6" 2'-514" 2'-10" 3'-9" 4'-7" 6'-0" 7'-0"	1'-6" 2'-5" 2'-9" 3'-81/2" 4'-6" 5'-8" 6'-7" 7'-4"	1'-1" 1'-9¼" 2'-3" 2'-10½" 3'-5" 4'-0" 4'-7" 5'-2"	0'-8" 0'-9" 0'-9" 1'-3" 1'-5" 1'-8" 1'-9" 2'-4"

JOHN SIMMONS CO.



Description of Action:

The apparatus consists of two measuring tanks of equal size, A-1 and A-2. Fig. 1, fitted each at one end with one or more siphon pipes C and at the other with weights D. The tanks work on the knife edges B, which are located at less distance from the counter weights D, than from the siphon pipes C. The liquid to be measured flows through the inlet pipe E, passing through valve F, into either tank, for instance as shown, in Fig. 1, into the left hand tank A-1. The weights D are so adjusted that the tanks will remain in a horizontal position until they contain a certain definite weight of liquid, then they will tilt into the position shown by the dotted lines on Fig. 2, and the liquid will begin to flow through the siphon pipe C. After this flow has been started and the level of the liquid in the tank has fallen sufficiently, the tank tilts back again to its original position by the influence of the weights D, the siphon continuing in action until the tank is emptied. As each tank assumes the position, indicated by the dotted lines, Fig. 2, it suddenly tilts the valve F over, so that the liquid, instead of continuing to flow into the tank A-1, begins to flow into the other tank A-2, when the same operations as already described are repeated and continued. It will thus be seen that both tanks are filled automatically with fresh liquid, while the measured liquid runs away into a reservoir, or other receptacle as required. As each tank tips the number of pounds contained is registered on the counter G, which is actuated by 291 the valve F.

When either tank is in a horizontal position the valve F rests upon the support J, not touching the tanks, therefore the time of tipping and the accuracy cannot be affected, either by the valve, or by the pressure of the running liquid in the valve, or by the resistance in the mechanism of the counter.

It should be noted that the tilting of the tanks (and consequent recorded measurement) is entirely accomplished by the introduction into them of a definite weight of liquid, regardless of variations in specific gravity which might be caused by temperature or otherwise.

In cases when the rate of flow varies considerably, the only source of inaccuracy is the varying quantities of liquid, which fall into the tank during the time of the tank motion. To eliminate even this error and to make the accuracy practically perfect under all conditions, a Type B Weigher has been devised, in which at the moment of tipping but a small flow feeds the tank, the larger part of the total flow being previously deflected into the other tank by means of a simple float mechanism.

NATIONAL METER COMPANY

Established 1870

299 Broadway

NEW YORK CITY

Manufacturers of Water Meters

BRANCH OFFICES:

CHICAGO, 2626 So. Park Ave. Boston, 159 Franklin St. ATLANTA, 200 Ivy St. WINNIPEG, MANITOBA, 111 Ethelbert St.

CINCINNATI, 415 Sycamore St.
SAN FRANCISCO, 141 New Montgomery St.
London, 25 Victoria St.

No matter what your conditions may be, we can offer you the BEST METER FOR YOUR SERVICE.

THE CROWN METER:

A positive displacement water meter of the rotary piston type. This meter has been made and sold by us for nearly forty years. It is substantial, durable and accurate. In sizes from 5%" to 6".



THE EMPIRE METER:

A positive displacement water meter of the oscillating piston type. It is the most accurate, durable and generally satisfactory meter manufactured. Owing to the simple construction of its



measuring chamber the accuracy of this meter can be maintained indefinitely at a minimum cost. The Empire meter is also manufactured for measuring oil, hot or cold—cane juice—brine, vinegar, liquid soap, gasoline, wine, etc. Made in sizes from 5%" to 6".

THE NASH METER:

A positive displacement water meter of the disc type. This meter has been on the market for over twenty-five years and is strongly constructed and reliable.



Its special frost-proof feature and straightreading register are both desirable abvantages. Made in sizes from 5%" to 6".

THE GEM METER:

A water meter of the velocity or current type and has been made by us since 1870. It is intended for service wher a large and rapid delivery of water is of special advantage.



Made in sizes from 2" to 12".

THE PREMIER METER:



A water meter constructed of a Venturi Tube and a by-pass on which an accurate, positive displacement meter is installed. This meter is intended to measure the complete supply of a city or other large service. The Premier is made in sizes from 8" to 48".

THE EMPIRE COMPOUND METER:

A water meter constructed by combining our Empire and Gem meters. It will measure with great accuracy large and small flows and will



flows and will operate most satisfactorily under greatly varying conditions. The Empire section is always open. The Gem section is controlled by a check valve which opens automatically when called upon to measure a stream larger than the capacity of the Empire. Made in sizes from 2" to 12".

NEPTUNE METER COMPANY

50 East 42nd Street, NEW YORK CITY

Trident Water Meters—The Weber Subterranean Pump

BRANCH OFFICES

ATLANTA Boston CHICAGO CINCINNATI DENVER

Los Angeles Portland Salt Lake City San Francisco SEATTLE

SPOKANE
VANCOUVER, B. C.
LONDON, ENGLAND
PARIS, FRANCE
KOBE, JAPAN

TRIDENT PRE-EMINENCE:

Nearly 2,000,000 Trident meters in service indicate the supremacy of the Trident.

This supremacy is the result of one factor-the worth of the Trident.



Breakable Bottom



Trident Split Case



Trident Style 3



Trident Portable Test



Trident Victor

FOR EVERY CLASS OF SERVICE:

There is a Trident Meter for every class of service.

Special meters designed for special requirements.

Write us.



Trident Cres





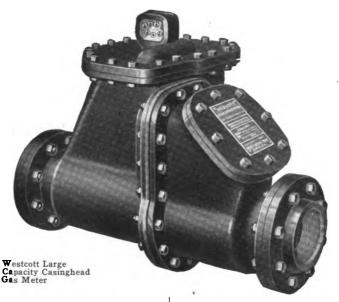
Trident ertical Crest

Trident Protectus-A Fire-Service Meter

METRIC METAL WORKS

ERIE, PENNSYLVANIA

Manufacturers of Gas, Steam and Air Meters



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LARGE CAPACITY METERS:

For Measuring Casinghead Gas under pressure or vacuum Natural Gas in large volume under high or low pressures.

ORIFICE METERS:

For Measurement of: Natural Gas, Manufactured Gas, Coke Oven Gas, Compressed Air,

Steam.

Special bulletins on each type of meter sent on request.

IRONCASE METERS:



5-B Ironcase Meter

For Natural Gas,

Manufactured Gas,

High and Low Pressure.

PITTSBURGH METER COMPANY

GENERAL OFFICE AND WORKS: EAST PITTSBURGH, PA.

SEATTLE Naw York CHICAGO KANSAS CITY LOS ANGELES COLUMBIA, S. C. 149 Broadway 5 S. Wabash Ave. Mutual Bldg. 802 Madison St. Union Oil Bldg. 1433 Main St.

Manufacturers of "Ironclad" Cast Iron Dry Gas Meters, Positive and Proportional Gas Meters, Meter Provers, and Keystone, Arctic, Keystone-Compound, Eureka and Utility Water Meters. Also Meters for Measuring Oil, Gasoline and Hot Water

WATER METERS:

Meters for the measurement of hot or cold water, oil, gasoline and all other liquids.



Arctic Water Meter

"Arctic" Water Meters for cold cli-mates, "Keystone" Water Meters for mild climates. These are Disc-Type Meters. In the Current or Inferential Types we manufacture the "Eureka" Meter, and in the Compound Type the "Keystone-Compound" and the "Utility" Meters.



Keystone-Compound Water Meter

Among these various types may be found meters adapted to every class and condition of service-domestic commercial and industrial.

GAS METERS:

Meters for the measurement of natural and artificial gas of all kinds, including that used in the arts, as well as for combustion, are manufactured in both wet and dry types.



Westinghouse Positive Gas Meter

Westinghouse Gas Meters, positive and proportional, are particularly adapted for gases at high or low pressures, in large 295 or small volumes.

Their all-metal construction gives them great durability under all conditions of severe service.



"Ironclad" Dry Gas Meter

The "Ironclad" Cast-iron Dry Gas Meter is designed for use on domestic and commercial service furnishing natural or artificial gas.

Its simplicity of construction, combined with the material used, affords an extremely low maintenance cost in conjunction with a high degree of accuracy.

We also manufacture apparatus for proving water and gas meters.

BUILDERS IRON FOUNDRY

PROVIDENCE, R. I.

Venturi Meters for Cold Water, Hot Water, Brine, Chemical Solutions, Sewage, Steam, Gas and Air; Globe Special Castings for Water Works; Grinding Machinery; Polishing Machinery



The Venturi Tube

THE VENTURI METER:

The Venturi Meter consists of a Venturi Meter Tube and an Indicating, Recording or Registering Instrument. The Meter Tube is set in the ing instrument. The Meter Tube is set in the pipe line in the same manner as a section of pipe, and the Instrument, which is connected to the Meter Tube by two small pressure pipes, can be set in any convenient space where the readings may be easily observed. Bulletin No. 90, "Measuring Water," is of engineering and historical interest.

THE VENTURI HOT WATER METER:

The VENTURI is admirably adapted to the The VENTURI is admirably adapted to the measurement of hot boiler feed water, hot water from condensers, hot circulating water for heating systems, etc. The entire absence of mechanism or projections within the Venturi Tube, which is the only portion of the METER through which the water flows, prevents scoring, warping and clogging. Bulletin No 92 describes fully.

THE VENTURI COLD WATER METER:

This is a type which may be used in connection with Gravity Mains, Pump Discharge Lines, Piltration Plants, Sewage Disposal Systems, Hydraulic Turbines, Refrigerating Plants, etc. Bulletin No. 84 contains descriptions, illustrational descriptions, illustrations of the contains descriptions. tions, tables of capacities and other data.

VENTURI AIR, STEAM AND GAS METER:

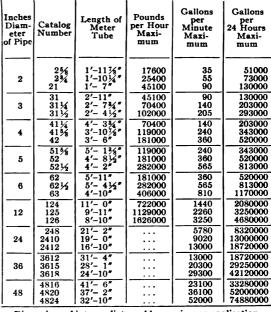
For the measurement of Air, Gas and Steam the Venturi offers distinct advantages, among which are Simplicity, Compactness, Adaptability Changes in Measuring Capacity and Low Cost. Bulletin No. 86 describes the Meter for Air and Gas and Bulletin No. 79 for Steam.

Any or all of the above Bulletins will be mailed on request.



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STANDARD VENTURI METER TUBES AND CORRESPONDING MEASURING CAPACITIES





Dimensions of intermediate and larger sizes on application.

SIMPLEX VALVE & METER COMPANY

GENERAL OFFICE AND FACTORY, PHILADELPHIA, PA.

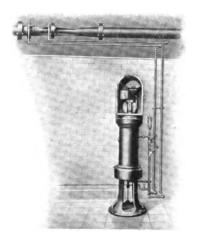
REPRESENTATIVES

MONTREAL, CAN., Coristine Building SAN FRANCISCO, CAL., Call Building DETROIT, MICH., Dime Bank Building BOSTON, MASS., 141 Milk Street CHICAGO, ILL., 30 N. Michigan Blvd. MINNEAPOLIS, MINN., 423 Fifth St., South CLEVELAND, OHIO, 876 Rockefeller Building PITTSBURGH, PA., House Building

KANSAS CITY, Mo., 307 Mutual Building

Manufacturers of Water Measuring and Controlling Devices with Venturi and Pitot Tube Meters, Rate of Flow Controllers, Filter Gauges, Portable Flow Recorders, Manometers, Altitude Valves. Water Flow Investigations

Venturi Tube can be horizontal or vertical



For Boiler Plants and Industrial Measurement, with Metal Cover

SIMPLEX METERS WITH VENTURI

Operated by Simplex shaped displacement floats, which move in direct proportion to the total velocity without sliding friction.

Simplex Meters are used when it is desired to measure the greatest range of flow of liquid with the greatest accuracy.

Construction is reduced to the simplest form. They prove dependable in service.



For General Pumping Station Use with Glass Cover

They are sensitive and, at the same time, accurate.

These meters may be used for measurement of SEWAGE, INDUSTRIAL LIQUIDS, HOT and COLD WATER, etc. They may be installed so as to be proof against freezing.

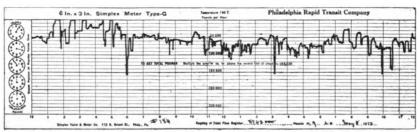
They are fully described in Bulletins.

13C, Water Meters for General Purposes.

13D, Simplex Hot Water Meter.

13E, Simplex Pitot Tube Meter.

RECTANGULAR CHART FROM SIMPLEX METER
Uniform graduation for all velocities



297

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BACHARACH INDUSTRIAL **INSTRUMENT COMPANY**

PITTSBURGH, PA.

Manufacturers of Precision Instruments

"HYDRO" PRESSURE RECORDERS are the simplest and most accurate instruments for recording pressure, vacuum or differential pressure. The absence of stuffing boxes, gears, levers, diaphragms, or electrical devices completely eliminates friction, thus producing an instrument that quickly responds to changes in pressure.

Pressure, vacuum or disserential pressure as low as one thousandth of an inch of water or as high as 15 lbs, per sq. inch, is measured and recorded accurately on rectangular charts.

"HYDRO" FURNACE RECORDERS



are designed especially to give a graphic record of the draft conditions for boilers and furnaces. They have a maximum range of 4" water and are furnished in three types. SINGLE DRAFT, may be either above or below the pressure of the atmosphere or both, such as furnace draft. DIFFER-ENTIAL DRAFT

between any two points. For example between furnace and under the damper. COMBINED SINGLE AND DIFFERENTIAL, recording the two on the same chart such as furnace draft and differential between furnace and under damper.

CARBON DIOXIDE INDICATOR:



A simple, compact and rugged instrument for the determination of carbon dioxide in the flue gases. No special skill or knowledge required for its operation. Packed complete our apyrein mechanical engineering ing case.

"HYDRO" GAS METERS indicate, record and integrate the volume of gas flowing in pipes and ducts. They have an unlimited capacity and their accuracy is unquestioned. Can be used for static pressures as high as 15 pounds per square inch.

INDICATING FLOW METER is an inexpensive and accurate instrument for indicating the volume and pressure of air delivered to cupolas, water gas sets, etc. Provided with special valve which opens and closes both pressure lines simultaneously and also arranged so that a zero reading can be taken without disconnecting pipe lines.

PITOT TUBES:

All sizes and types from the delicate instrument for laboratory and experimental work to the large tubes for un-washed blast furnace and producer gas. Also special magnifying tubes for low velocities.

THIN PLATE AND STANDARD ORIFICES of any size and to fit any pipe. Great care is used in forming the standard orifices to the correct shape.

MANOMETERS:

The V shape of the frame gives complete protection to the glass tube and permits the reading of the scale from any angle. Any liquid can be used, the instrument having a maximum range of 42" mercury.

STEAM AND GAS ENGINE INDICA-TORS:

The Maihak type of indicators comes in three styles which cover the entire range of speeds up to 1500 R. P. M. This indicator can be fitted with the power integrator which gives, without calculation, the mean indicated H. P. over a given time of any reciprocating unit.

TACHOMETERS:

Stationary and hand tachometers which give the instantaneous speed and its variations.

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BAILEY METER COMPANY

2009 E. 46TH ST., CLEVELAND, OHIO

Manufacturers of Recording Meters and Instruments

BAILEY FLUID METERS:

Are the most practical and accurate meters for recording and integrating the flow of steam to turbines, engines, heating systems, general mill use; low pressure steam, exhaust, and in fact for all purposes. Equally well adapted to measure the flow of water, air, gases and other fluids, under practically all conditions of pressure, temperature and capacity.



There are but two moving parts to this meter and they are not subjected to the direct action of the steam, hot gases or other fluid being metered. The meter is operated by a pressure difference which is produced by the fluid flowing through an orifice placed between a pair of flanges in the pipe line.

Bailey Fluid Meter Type C2 Recording and Integrating Flow, also Recording Pressure and Temperature illustrated above.

BAILEY BOILER METER:

This meter records Steam Flow, Air Flow and Flue Gas Temperature all on the same chart. It may also be provided with fire box draft indicator, wind box pressure recorder or other supplementary records. It also may be provided with integrator giving the total evaporation from the boiler in thousand pounds of steam, from which the actual evaporation of useful steam delivered to the header per pound of coal is determined.

The most important feature of this meter lies in the ratio between the Air Flow and Steam Flow. Air is a fuel just

as much as coal, and a certain evaporation per pound of air should be obtained. When this condition exists the two pens and records show the same reading. When there is an excess of air, the Air Flow reading is greater than the Steam Flow. A deficiency of air resulting in loss due to unburned gases is shown by the Air Flow reading being less than the Steam Flow.

Flue gas temperature recorded on the same chart is a positive check against dirty tubes and leaky baffles.

BAILEY WEIR METER:

Records and integrates flow of water or other liquids through V-Notch or rectangular weirs. For feed water, hot well discharge, etc., at or near atmospheric pressure.

BAILEY GAS METER:

Records the rate of flow of low pressure gas or air at high or low velocities, with 4½ inch pen motion on 12 inch chart and integrates total flow reading directly in cubic feet. It can be equipped to record pressure or temperature or both on the same chart. Net pressure loss due to meter ½ inch of water.

The orifice can be easily inserted in some existing flange and requires no alterations in the piping. A change of orifice will give a change in capacity at slight cost. The recorder may be connected to two or more pipes so that records may be taken at will. It can be conveniently moved so that it is available for tests and temporary installations.

These meters are now in use measuring coke oven gas at a number of locations and service of over a year has demonstrated their reliability.

The meter is low in first cost and maintenance and operating costs are negligible.

OTHER TYPES:

Many other types of recording meters for special purposes such as specific gravity of liquids or gases, relation between the flow of two fluids or gases, differential temperatures and rate of flow for economizers and hot water heating systems.

Bulletins describing the complete line of Bailey Recording Meters will be sent free upon request.

OURADVIE IN MECHANICAL ENGINEERING THE ASME

REPUBLIC FLOW METERS CO.

565 WASHINGTON BLVD., CHICAGO, ILL.

Manufacturers of Recording Flow Meters and Power Plant Instruments

BRANCH OFFICES

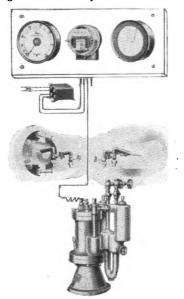
NEW YORK BOSTON PHILADELPHIA

TORONTO

Pittsburgh Detroit Atlanta

REPUBLIC FLOW METERS:

Measure the flow of steam, water, air and gas accurately and conveniently. A Pitot Tube or Orifice Disc is used to obtain the differential pressure of the flow, the selection of one or the other being determined by the conditions of



flow. The Meter Body is connected to the Differential Medium by short lengths of 3%" piping. A wire is led from the terminal post of the Meter Body to the instrument panel which can be located at the most convenient point for observation, regardless of distance. A Transformer is supplied which steps down the available voltage to 40 volts used on the meter circuit. The reading instruments are shown on the panel.

ADVANTAGES:

300

Maximum Accuracy:

The maximum accuracy is insured by the highly sensitive electrical instruments

which are governed by the well-known relation between velocity of fluids and equivalent pressure.

No Moving Parts:

By employing electric current to transmit the action to the reading instruments, all uncertain mechanical appliances such as floats, cams, levers, gears and stuffing boxes are avoided. There are no moving parts in the Meter Body to interfere with the true level of the mercury column.

Flexibility of Installation:

Due to the electrical principle of operation, the instruments for indicating, integrating and recording the flow may be arranged to conform with every variation of plant conditions. They can either be separated, combined, or duplicated; and can be placed at any desired distance from the measured line and at any point however remote from the Meter Body.



BOILER INDICATOR:

The Indicating dial used for boiler mounting is 15" in diameter. The figures, which are 1¾" high, can be distinctly read at a considerable distance. Graduations can be made directly in Horse Power or Pounds per hour. Brackets are supplied to facilitate installation.

Send for bulletins.

PNEUMERCATOR COMPANY

15 PARK ROW, NEW YORK, N. Y.

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Chicago, Ill	Brewer & Anderson, Monadnock Block
San Francisco, Cal	J. C. Ferguson, Monadnock Bldg. W. S. De Pierris Co., Hoge Bldg.
VANCOUVER, B. C	Brown, Fraser & Co., Ltd., 1150 Homer St.
Europe	Kelvin, Bottomley & Baird Ltd., Glasgow, Scotland

PRODUCT AND SERVICE:

"PNEUMERCATOR" Gauges indicate the depth, weight, volume or specific gravity of any liquid or semi-liquid, fluid enough to seek its own level.

USE:

Tanks, Standpipes or Reservoirs.

A Fneumercator Gauge installed in any tank will provide a perpetual inventory of the liquid stored in the tank—an accurate check on liquid put in or withdrawn from the tank.

The gauge will operate with equal accuracy on tanks open to the atmosphere or under pressure or vacuum.

The accuracy is not affected by changes in temperature of the liquid in the tank, or the temperatures through which the pipe line connecting the tank to the indicating portion of the apparatus may pass.

There are no floats, diaphragms or delicate mechanism of any kind to stick or get out of order.



PRINCIPLE:

The operation of all models of "Pneumercator" gauges is based on the maintenance of a true hydrostatic balance between the head of liquid to be measured and a column of mercury or other indicating medium, the pressure being transmitted by air confined in a small connecting tube between the liquid and the gauge.

CONSTRUCTION: Four Elements.

- 1. A balance chamber, located in the liquid to be measured.
- 2. A mercury or other gauge, located wherever readings may most conveniently be taken.
- 3. A hand pump or other source of compressed air.
- 4. A control valve attached to the gauge, and connected by small piping to the balance chamber and to the source of compressed air.

APPLICATIONS:

Fuel Oil Tanks Acid Tanks Molasses Tanks Gasoline Tanks Chemical Storage Tanks Stills Evaporators Automatic Sprinkler Tanks Automobile Tank Trucks Reservoirs Standpipes Flumes Tail Races Dams Water Works Tide Fluctuations, etc., etc.

NOTICE:

The coined word "Pneumercator" is registered as our trade mark and attached to all instruments sold by us, our representatives or licensees under our patents throughout the world.

AS EACH "PNEUMERCATOR" GAUGE has to be made up for the specific purpose for which it is to be used, in order to advise and quote you intelligently it is necessary that we have the following information:

The dimensions of tank (or tanks), depth, diameter and cubical capacity per inch.

The distance from the tank to the indicating portion of the instrument.

The nature and specific gravity of the liquid to be measured.

Prices and full information will be promptly furnished on request.

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DEFENDER AUTOMATIC REGULATOR CO.

ST. LOUIS, MO.

Manufacturers of Automatic Damper and Stoker Regulators, Flue Gas Analysis Instruments, Draft Gauges, Pyrometers and Thermometers

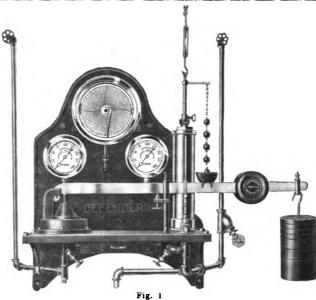
Defender Model B Automatic Damper and Stoker Regulator (Fig. I) with Variable Attachment. To make machine a positive Regulator all that is necessary is to lift off the ball weights.

All Cast Iron
parts are of Stove
Iron Castings.
Baked on Black
Enamel; mounted
on Cast Gauge
back, with 5"
Steam and Water
Gauges, and 8½"
302 Recording Steam
Pressure Gauge.

They are the greatest FUEL and LABOR saving machine that can be installed in any Boiler Plant.

They increase the FURNACE EFFI-CIENCY by raising the CO₂.

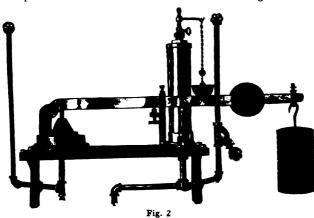
They increase the BOILER EFFI-CIENCY by reducing the Flue Gas Temperature.



Defender Model C Automatic Damper Regulator (Fig. 2) with Variable Attachment

ment.

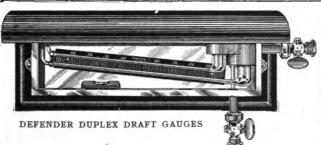
38" Steam line on the left, and 38" Water line on the right, with Discharge Water line in the center at bottom. Water Strainer is shown on Water line at right. Write for Bulletin No. 1 of Catalogue No. 11.



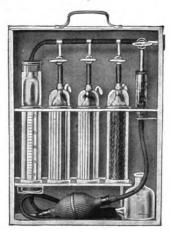
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Write for catalogue
No. 12 showing a
full line of Efficiency
Instruments, Combustion Appliances
and Damper, Stoker
and Fan Engine
Regulators.

DEFENDER AUTOMATIC REGULATOR CO.



Mounted on separate Cast Backs with folding protecting hoods either plain or with electric light attached. They read the Draft over the Fire. Draft at last pass of boiler and difference between the 2 indications is Differential or Drop in Draft through the boiler.



DEFENDER IMPROVED ORSATS FLUE GAS ANALYZERS. Made in 4 Models and 8 Styles



DEFENDER CONTROL BOARDS for mounting instruments on front corner of Boilers

6 Models for mounting different sets of Efficiency Instrument



DEFENDER INSTRUMENT GASES for mounting on front corner of boilers Indicating Flue Gas Pyrometers and Duplex Draft Gauges made in 4 models



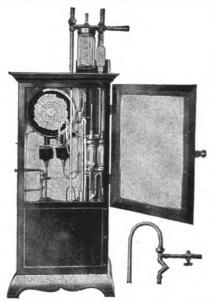
DEFENDER LONG DISTANCE FLUE GAS PYROMETERS. Made in round form Indicating and Recording and Portable. In a class by themselves.

Write for complete catalogue showing a full line of EFFICIENCY INSTRUMENTS. COMBUSTION APPLIANCES and DAMPER, STOKER and FAN ENGINE REGULATORS.

THE JOS. W. HAYS CORPORATION

MICHIGAN CITY., IND.

Manufacturers of Hays Apparatus



Hays CO2 and Draft Recorder Awarded Certificate of Merit by Franklin Institute

PRINCIPAL ADVANTAGES OF THE HAYS CO2 AND DRAFT RECORDER:

Visible operation.

304

Rapidity of absorption.

No mechanical moving parts except the pen arm.

Operated by moving columns of water, mercury and gas.

Low cost of maintenance and operation.

CO₂ and Draft recorded on the same chart.

Self-adjusting.

Water jacketed assuring uniform temperature of the gases. Continual service with the minimum of attention.

Three minute lag for each 100 feet of pipe.

Low efficiency alarm indicating immediately when CO₂ drops below the predetermined percentage Alarm can be located in front of each furnace and in office of Engineer.

Gas sample analyzed every one to four minutes as preferred.

Automatic pen lifter releases pen from the chart when desired making it impossible to spoil record.

The above fully explained in our CO₂ and Draft Recorder Catalogue.

Write for copy. It contains interesting and convincing data.

Ask for descriptive literature concerning:

Hays Improved Hand Analyzer for CO₂—CO—O₂.

Hays differential draft gages, all types and ranges.

Hays recording draft and temperature gages.

Hays automatic gas collector.

All of which are constructed on the principle of continual service and accuracy.

MONO CORPORATION OF AMERICA

COAL AND IRON EXCHANGE BUFFALO, N. Y.

Manufacturers of Mono CO₂, CO, O₂, SO₂, H₂ Automatic Recorders

MONO CO2 AND SO2 RECORDER:

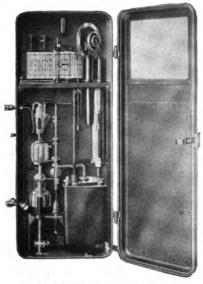


Fig. I—MONO Combustion Recorder Type "A-B"

We present above the simplest and most accurate Combustion Recorder MONO. It is driven by compressed air or water, the pressure raising a mercury column in a 100 cc. burette and releasing same, thus drawing in a charge of gas, forcing same through the caustic potash and measuring it after absorption in a gasometer. The difference by volume is recorded on a wide sixty days' chart. The installation consists of fine copper tubing, thus there is no "lag" and no water or steam injector is required.



Fig. 2-MONO Monoxide Recorder

Two filters, moisture-temperature regulator and filing device are part of the apparatus

MONO CO RECORDER:

(See also Fig. 5.) For the first time in the history of recording instruments, we are now offering to cement plants, chemical works and producer gas plants, as well as for boiler room use, our MONO Monoxide Supplement, type "K," which is an auxiliary apparatus attached to the CO₂ Recorder, thus permitting of recording CO₂ as well as CO on one chart.

MONO O2 RECORDER:

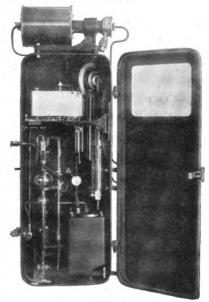


Fig. 3-MONO Oxygen Recorder

Another auxiliary, type "S," can be attached to the CO₂ Recorder MONO, making the apparatus suitable by changing valve "A" also for analysis of Oxygen, thus the CO₂, CO, O₂ combination is formed. A very desirable apparatus for lime kilns and hundreds of industrial purposes. The oxygen is absorbed in a special oxygen cartridge under high heat electrically generated. We draw special attention to the fact that almost any range between 0 and 100% purity can be supplied. Ask for particulars.

PRECISION INSTRUMENT CO.

NEWARK, NEW JERSEY

We manufacture:

Gas Collectors
Chemical Glassware
Gravitometers
Gas Test Meters
Coal Calorimeters
Air Speed Indicators
Mercury Column Gauges, etc.

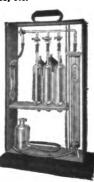
FLUE GAS ANA-LYZER:

50 c.c. Orsats graduated to 1/2 per cent.

100 c.c. Orsats graduated to 1/10 per cent.

Made with any number of pipettes desired.

Our Orsats have half the weight and onequarter the volume of the ordinary type.



U-TUBE GAUGE:

Made in numerous types and all lengths. Backs of asbestos wood that cannot warp and are not affected by heat or moisture. Heads cut from solid steel blocks. Provision made for filling, draining and cleaning Neat in appearance, rugged in construction.

RECORDING GAUGE: (Pressure or Draft)

Guaranteed accurate at all points of scale.



306



"2 IN I" DRAFT GAUGE:

(Indicating)

For natural draft boilers. Diaphragm type of gauge. Also used on economizers and waste heat bodiers. Guaranteed accurate at all points of scale. Ranges for your requirements.



"2 IN I" DRAFT GAUGE:

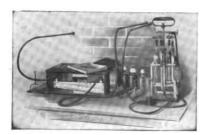
(Recording)

Also can be supplied in round case "3 in 1."

Gives the superintendent or chief engineer a permanent record of draft conditions. Diaphragm type of gauge. Guaranteed accurate at all points of scale. Ranges for your requirements.

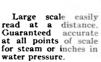
EFFICIENCY KIT:

A neat metal case for carrying the instruments, forms part of kit. Complete for Boiler Test.



INDICATING GAUGE:

(Pressure Gauge or Combined Draft and Pressure)

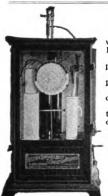




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Our Service Department is for You.
All Instruments Fully Covered by the Famous
Precision Guarantee.

PRECISION INSTRUMENT CO.

NEWARK, NEW JERSEY



CO2 RECORDER: (24 Hour Chart)

We make recorders to work against a vacuum of 18 inches of water.

Standard range per cent. Other ranges up to 100

Accurate to 1/2 of 1 per

cent. CO2. We also make 60-day tape combined CO₂ and draft recorders.



GRAVITOMETER:

Records specific gravity of gases either lighter or heavier than air. Re-quires only connection to gas supply.



COMBINED INDICAT-ING AND RECORD-ING GAUGE:

(Pressure or Draft)

Has an indicating scale for the operating man and a 60-day tape re-cording chart giving a permanent record.



"5 IN I" DRAFT GAUGE:

For use with Coxe or Harrington forced draft stokers where the air space below grate is divided into three compartments, Gauge is also applicable to other spaces. stokers with economizers.



DIFFERENTIAL DRAFT GAUGE:

(Single)

Sliding scale, leveling device and micrometer adjustment.

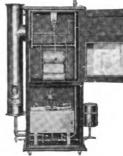


"3 IN I" DRAFT GAUGE:

For forced draft stoker fired boilers. Gives pressure in wind box, draft over fuel bed, and draft at last pass. Length 20½ inches. Diaphragm type of gauge. Guaranteed to be accurate at all points of scale. Test cocks a feature.



Gives continuous 60-day record of calorific value of gas. Compensates for variations in pressure volume and specific gravity.

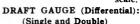


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TAPE RECORDING. GAUGE:

Draft, (Pressure re or Draft, or Water) Steam

Gives record on 60 day chart. All Precision gauges are equipped with patented dead heat pen movement and are guaranteed to be accurate at all points of curate at all points of scale.





Double Illustrated

Sliding scales, leveling device and micrometer adjustment.

Write for Catalog. Our Service Department is for

You.
All Instruments Fully Covered by the Famous Precision Guaran-





UEHLING INSTRUMENT COMPANY

2011 EMPIRE BUILDING, NEW YORK CITY

Manufacturing Engineers—Combustion Economists

UEHLING CO2 RECORDERS:

the

Uehling CO2 Equip-

means for obtaining

and maintaining high

ment provides

boiler efficiency. Such equipment consists of the Instrument Proper, which can be located in the engineroom or any other convenient part of the plant, the Recording Gauge, which can be located in the office 308 of the Chief Engineer or Superintendent, and the Auxiliary CO2 Indicator, which can be located at the boiler front to serve as a working guide for the



UEHLING
CO2 RECORDER
No Chemical
Solutions

fireman. By means of the Indicator the fireman can be held responsible for the fuel wasted up the chimney, just the same as he is held responsible for an even steam pressure by means of the steam gauge.

The per cent of CO₂ in the products of combustion is a true index of the excess air used; the lower the per cent of CO₂ the greater the volume of products of combustion per pound of fuel consumed; since all gases leave the boiler at stack temperature the per cent of CO₂ in the products of combustion bears a direct relation to the sensible heat wasted up the chimney.

OTHER UEHLING INSTRUMENTS:

Uehling Draft Recording Gauge.
Uehling Differential Draft Recorder.
Uehling Draft Indicator.
Uehling Differential Draft Indicator.
Uehling Draft Analyzer.
Uehling Light Pressure and Vacuum
Recorder.

Uehling Vacuum Recorder.

Uehling Combined Barometer and
Vacuum Recorder.

Uehling Absolute Pressure Indicator.

Uehling Pneumatic Pyrometer. Uehling Revolution Recorder.

The distinctive features of Uehling Recording Instruments are Simplicity, Accuracy and Reliability. They are based on the hydrostatic principle, by the application of which all springs, levers and joint movements are avoided.

In addition to these important advantages, the hydrostatic principle permits of making the scale open between the limits where the readings are important, and narrow where they are unimportant, or eliminating that part of the scale altogether which is of no use, thus utilizing the whole width of the chart for important readings.



Send for Catalogs and booklet "Combustion and the Cost of Power."

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THE ASHTON VALVE COMPANY

161 FIRST ST., CAMBRIDGE, BOSTON, MASS.

137 Liberty St., NEW YORK

BRANCH OFFICES 318 W. Washington St., CHICAGO, II.I. 503 Mission St., SAN FRANCISCO, CAL.

Manufacturers of Pop Safety Valves, Pressure and Vacuum Gages and Kindred Engineering Specialties

ASHTON **IMPROVED** POP THE SAFETY VALVE:

Embodies the latest improvements in the state of the Art and has been the acknowledged Quality Standard among Engineers for the past 49 years. When of proper size Ashton Valves give prompt and full relief to a boiler and prevent any accumulation of pressure above the point at which they are set. They are reliable and sensitive in action, and operate with a uniform and only moderate blow back, thereby showing greatest economy in both fuel and steam. They are solid in con-struction with all working parts of high grade material insuring most durable service and lowest cost of maintenance.



Ashton Pop Safety Valves are made to give any desired capacity of relief, and when so specified are furnished to fully comply with the requirem ents of the A. S. M. E. Boiler Code, as well as any special state or local regulations.

THE ASHTON IMPROVED DEAD WEIGHT PRESSURE GAGE TEST-ER:

Offers the most modern method for obtaining an accurate test of pressure gages by means of weights. It is convenient in form and readily portable, being packed in two separate cases with locked covers and furnished with substantial handles.

The style illustrated with double area piston requires only one-fourth the usual number of weights and is suitable for high pressure testing up to various maxi-



mums from 200 to 2000 lbs. per sq. in. It is also adaptable for low pressure testing by a simple adjustment of the two small valves on opposite sides of the vertical

cylinder, which can readily be done while the machine is in

THE ASHTON IMPROVED PRESSURE AND VACUUM GAGES:

Are made for all kinds of service in either plain registering or recording styles, and of either single or double spring construction. The springs are of best quality seamless drawn tubing, the movements 309 non-corrosive with nickel-silver pinions and arbors, and the dials accurately graduated.



Ashton Recording Gages as illustrated give a daily record on paper charts showing all pressure variations both day and night giving the time and length of every change, thus assuring careful firing, steady pressure, and highest efficiency and economy. Each gage is furnished with one year's supply of charts, ink and pen filler.

finely illustrated Our No. 18 catalogue of 176 pages tells all about the full line of Ashton Specialties. Write for it NOW.



CROSBY STEAM GAGE & VALVE CO.

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SAN FRANCISCO, 121 Second St.

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Manufacturers of Standard Steam Appliances

We present for the consideration of Mechanical Engineers certain instruments of our manufacture which we believe are scientifically and mechanically the best of their kind yet produced.

GAGES:



310

Crosby Pressure Gage

For any and all purposes.

REVOLUTION COUNTERS:

Positive in action, reliable, durable.

An instrument of wide application and of the greatest usefulness to engineers.

GAGE TESTING INSTRUMENT:



Crosby Pressure Gage Tester

Made on scientific principles and is mathematically correct.

RECORDING GAGES:

A Dependable
Instrument, for
Accuracy and
Service. Jewelled
Clock Movement,
Recording Pressure, Vacuum
Hydraulic, Daily,



Crosby Recorder

Weekly, Continuous Records.

INDICATORS:

Steam, Gas, Hydraulic, etc.

As perfect in workmanship and operation as human skill can devise.



Crosby New Indicator

Also Lanza Continuous Diagram Appliance—Reducing Wheels—Boiler Test
Pumps—Vacuum Pumps—Planimeters—
Electrically Operated Chime Whistles—

All CROSBY Quality.

Address any of our stores and you will receive a prompt and courteous reply.

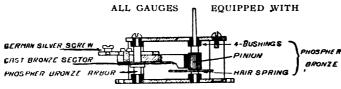


(See page 216 for additional products of this Company)

J. E. LONERGAN CO.

211-215 RACE ST., PHILADELPHIA, PA.

Manufacturers of Boiler, Steam and Gas Engine Specialties



Non-Corrosive Movement-Sectional View



Pressure Gauges for steam, water or air, or vacuum. Pressure gauges gradu-



Pressure Gauge

ated to any pressure not exceeding 500 lbs. Vacuum gauges graduated to 30".

Type "D" Short Spring, strong, non-freezable.

Model "GAS" Short Spring, strong, non-freezable, with Auxiliary Helical Spring attached to end of main spring, lengthening life of gauge where fluctuation of pressure or vibration is excessive.

Model "GDS" Double Spring, strong, non-freezable, made of one piece of seamless drawn bourdon tubing, insuring accuracy.

Pressure and Vacuum Gauge: Generally used on Compound Engines, Receivers and Heating Systems.

"Combination" Water Works Gauge: Used to indicate pressure of water per square inch and corresponding height of column of water in feet. Adapted for use in Water Works, Pumping Stations, Mines, Stand Pipes, etc.

"Altitude" Gauge: Used to indicate height of water in feet in tanks, reservoirs and in connection with Hot-water Househeating Systems. Are generally graduated to 70 feet.

Double and Auxiliary Spring "Locomotive" Gauges.

"Tractor Engine" Gauges: Generally graduated to 300 lbs.

"Ammonia" Gauge: Made expressly for use with ammonia and other liquids affecting brass. Tubes are made of a



Ammonia Gauge

very high-grade steel and carefully tempered. For use on ice and refrigerating 311 machines.



Hydraulic Gauge

"Hydraulic" Gauge: Can be graduated to any pressure not exceeding 20,000 lbs. per square inch.

Mechanical Men simply read our SPECI-FICATIONS and are convinced.

"Movement" for all of our high-grade gauges. All wearing bearings have PHOSPHOR BRONZE BUSHINGS twice their diameter in length.

Sector, cast bronze, with face three times as wide as the regular sector.

Pinion, Arbor and PHOSPHOR BRONZE. and Hair Spring, made of

This insures a gauge with exceptional wearing qualities, long life and accuracy.

"Springs" made for hard work.

Sector suspended vertically which reduces wear on teeth of sector and pinion to a minimum.

"Dials" all graduated by hand, made of brass, silver plated with black lettering.

(See page 217 for additional products of this Company)

UNITED STATES GAUGE CO.

37-39 LIBERTY ST., NEW YORK, N. Y.

WORKS: SELLERSVILLE, PA.

CHICAGO SAN FRANCISCO Boston Birmingham DETROIT NEW ORLEANS Philadelphia Montreal

Manufacturers of Pressure and Vacuum Gauges

AMMONIA GAUGES:



See Bulletin !!
HYDRAULIC GAUGES:

312



OXY-ACETYLENE GAUGES:



We are the largest manufacturers of Pressure and Vacuum Gauges in the world.

RECORDING GAUGES:



See Bulletin 46

ELECTRIC ALARM GAUGES:



See Bulletin 37

COMPOUND GAUGES:



See Bulletin 10

Our catalogue gives complete information.

Consult the Engineering Department,

THE BRISTOL COMPANY

WATERBURY, CONN., U. S. A.

Boston Old South Bldg.

NEW YORK 114 Liberty St.

PITTSBURGH Frick Bldg.

CHICAGO Monadnock Bldg.

San Francisco Rialto Bldg.

Manufacturers of Bristol Recording Instruments for Pressure, Temperature, Electricity, Motion, Time, Speed, Etc.

BRISTOL'S RECORDING GAUGES:

For steam, air, gas and liquids. For all ranges of pressure and vacuum.

RECORD-BRISTOL'S ING LIQUID LEVEL GAUGES:

For automatically recording depths or levels of water or other liquids.



Recording Gauge

BRISTOL'S RECORDING THERMOM-ETERS:

For all commercial ranges of temperature from 60° below zero to 800° Fahrenheit.



Recording Thermometer

BRISTOL'S INDICATING ELECTRIC PYROMETERS:



Indicating Pyrometer

High resistance model, for measuring temperatures up to 3000° F.

BRISTOL'S RECORDING PYROMETERS:

High Resistance Model for recording temperatures up to 3000° F.

> Recording Pyrometer



RECORDING VOLTMETERS. AMMETERS WATTMETERS:

BRISTOL'S

For all ranges of A. C. and D. C. Can be furnished for switchboard or portable service.

BRISTOL'S ELECTRICAL AND MECHANICAL **OPERATION** RECORDERS:

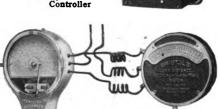
recording time of mechanical movements. machine operation, valve reversals, etc.



BRISTOL'S ELECTRIC TEMPERATURE CONTROLLER:

For measuring and controlling temperatures in gas and electric furnaces, etc.

Temperature Controller



Long Distance System

BRISTOL'S PATENTED LONG DISTANCE ELECTRIC TRANSMITTING AND RECORD-ING SYSTEM:

For measuring and recording at remote points, pressure, liquid level, temperature and motion. For instance, records may be transmitted over distances of five miles or more.







THE BROWN INSTRUMENT CO.

PHILADELPHIA, PA.

NEW YORK DRNVER PITTSBURGH SAN FRANCISCO DRTROIT CHICAGO LOS ANGRLES

St. Louis

Manufacturers of Pyrometers, Thermometers, Tachometers, Time and Operation

Recorders, Recording Gauges

BROWN PYROMETERS:

Operate on the thermo-electric principle. Adapted for all ranges of temperatures from 300° F. to 3000° F. For tempera-

BROWN ELECTRIC PYRO

The Brown High Resistance Indicating Pyrometer

tures below 300° F ., Brown Resista nce Ther mometers are recom mended. For tem peratures

above 3000° F., the Brown Radiation Pyrometer is

BROWN RECORDING PYROMETERS:



314

Make a permanent record of temperatures -single or multiple charts.

Brown Pyrometers are also made to regulate or control automatically temperature of electric, gas or oil furnaces.

The Brown Duplex Continuous Recording Pyrometer

BROWN LONG DISTANCE RECORD-ING THERMOMETERS:

These instruments accurately record temperatures up to 1000° Fahr or 500° Cent.

Operate on the well-known principle of the expansion of gas or liquid with change of temperature. Capillary tubing can be 100 Fitted with

flexible steel-armored tubing. Bulbs have been developed for every

The Brown Recording Thermometer purpose.

BROWN RECORDING PRESSURE GAUGE:



ranges of vacuum and pressure from a few ounces of water to 5000 lbs., Brown Recording Pressure Gauges are guaranteed completely as dependability to and accuracy.

For recording all

The Brown Recording Pressure Gauge

BROWN TACHOMETERS:



Indicating and Recording types for measuring and counting revolutions per minute. The Electric type records machine operations hundreds of feet away. The

Mercurial type operates the unvarying law of centrifuga 1 force.

The Brown Indicating Tachometer

Extensively used for recording the time of operation machinery, valves, switches. pumps, and for recording the reversals of melting tanks, open hearth furnaces and annealing furnaces; also for recording



The Brown Time Recorder

the time of starting and stopping of paper machines and other devices.

OTHER SCIENTIFIC INSTRUMENTS:

Resistance Thermometers, Thermometers of the Mercurial type, Recording Gauges, Temperature Controllers, and Vacuum Gauges are among other scientific instruments produced in our Laboratory, Wayne Junction, Philadelphia, visitors are always most welcome.

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THE FOXBORO CO., INC.

FOXBORO, MASS.

Indicating, Recording and Controlling Instruments for Pressure, Temperature, Speed, Time and Flow

> CHICAGO NEW YORK St. Louis

PHILADELPHIA

SAN FRANCISCO

PITTSBURGH CLEVELAND

TULSA

FOXBORO

FOXBORO-HEATH CO2 RECORDERS:



These recorders operated by water syphon with a minimum lag between stack and instrument.

Simple operation. Make a complete flue gas analysis every three or four minutes. Record shows percentage of CO2. A practical dependand instruable ment.

FOXBORO RECORDING GAUGES:

New inverted type will not allow ink to run down pen arm and blot the record.



Any range from full vacuum to 20,000 lbs. per square inch. For Steam, Gas, Water, Oil, Air, Brine, Ammonia-in fact, anything under Pressure or Vacuum.

FOXBORO RECORDING THERMOMETERS:

These depend upon expansion of liquids, gas, and the vapor tension of volatile liquids for their action.

Adapted for any operation where an accurate knowledge of temperature is needed. Any

range from-60° to +1000° Fht., or equivalent degrees in Centigrade and Reaumur. No multiplying devices used. Permanency

guaranteed.



315

FOXBORO LIQUID LEVEL RECORDERS:

Built primarily for recording varying levels of rivers, reservoirs, canals, forebays, tail-races, etc. Have been widely

adopted for sewer work, weir measurements, specific gravity recorders.





Many large Paper Mills use them on their Jordan Stuff Chests to get closer weights and more uniform products. Write for Bulletins.

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THE SCHAEFFER & BUDENBERG MFG. CO.

BROOKLYN, NEW YORK

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PHILADELPHIA

TULSA SAN FRANCISCO

PITTSBURGH Los Angeles

he Steam Supply & Rubber Co.

SRATTI.R

SALT LAKE CITY F. C. Richmond Machinery Co.

Instruments for Measuring, Indicating, and Recording Temperature,
Pressure and Speed

S & B GAUGES:

A complete line of Pressure, Vacuum and Draft Gauges for all requirements, also Column Gauges, Mercury Pressure and Vacuum Gauges, Gauge Testers, etc.



"CRESCENT" THERMOMETERS:

Among our line of high grade "Crescent" Thermometers will be found an instrument for practically every purpose. Our catalog No. 200 illustrates over types. Handsome seventy in appearance and perfect in mechanical detail and construction.

"Crescent" Specify size of scale case Thermometer desired, graduation, character and size of connection, character and length of stem, and the purpose for which the thermometer is to be used.

"REFORM" THERMOMETERS:

A dial face, mercury-filled indicating thermometer having the accuracy of the standard glass tube thermometer and reading convenience



"Keform" Thermometer

of a dial face. Entire working mechanism is made of steel, meaning long life. Standard size of dial, 6 inches. Other sizes made to order. Furnished with either rigid connection or flexible capillary steel tube connection. The latter greatly facilitates installation. State the graduation desired, character and length of connection and the purpose for which the thermometer is to be used.

"COLUMBIA" RECORDING THER-MOMETERS:

The most simple, yet the most reliable type of ecording Thermometer. Mercury actuated, Recording Thermometer. Mercury actuated, therefore absolutely accurate. Steel construction throughout combining extreme strength and durability with accuracy. Uniformity graduated, wide and effective ranged charts with the popular day and night border, made in two sizes, 8" and



Thermometer

12", respectively, for 24 hours or 7 days. Furnished with either rigid connection or flexible steel connection or flexible steel protected steel capillary connecting tubing of any lenth. State size of chart and graduation, length and character of connection and the purpose for which the recorder is to be used. corder is to be used.

THE "COLUMBIA" RECORDING GAUGE:

An exceptionally accurate and reliable instrument adaptable for all ranges of pressure, vacuum and draft. In portable and stationary types, for 8" and 12" day and night charts, respectively, making one revolution in 24 hours or 7 days as desired.



State size of chart and graduations, and the purpose for which the Recording the Recording Gauge

Gauge

"COLUMBIA" TACHOMETERS:



"Columbia"

We have a most complete line of Hand and Stationary Tachometers and we have recently added many new styles and types, covering absolutely every requirement met with in practice. Conment met with in practice. Con-structed on the most modern principles, accuracy guaranteed, compact and durable in construc-

tion, perfect in mechanical detail and handsome in appearance. State desired graduations and if Stationary Type Tachometer is wanted, the diameter and the normal speed of the shaft you will drive from.

CALORIMETERS:

We manufac-ture Professor Carpenter's pattern Calorimeters for Steam. throttling type of Steam Calorimeter serves for determining the amount of moisture contained in

Calorimeter

steam by measure-ment of the heat. Calorimeter
The Separating type is designed to show the percentage of water by mechanical separation of the water

by mechanical separation of the water from the steam.

S & B Calorimeters are easily MECHANICAL operated, requiring no technical Engineering knowledge, and results are most satisfactory for profited problems. factory for practical problems.



C. J. TAGLIABUE MFG. CO.

18 to 88 Thirty-Third Street, BROOKLYN, N. Y.

BRANCH OFFICES

TULSA, OKLA. BOSTON CHICAGO PITTSBURGH PORTLAND, ORE. SAN FRANCISCO Manufacturers of Instruments for Indicating, Recording and Controlling Temperature, Pressure, Liquid Levels, Condensate; Oil Testing Instruments, Gages, Etc.

APPLICATION:

TAG controllers are supplied with variations of features to best meet specific re-quirements. These controllers can be advantageously employed in practically every industry where a uniform temperature, pressure, etc., is a factor of importance.

TAG Self-Operating CONTROLLERS:

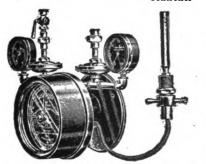
Require no auxiliary motive power and can be applied

either in a vertical or horizontal position. They are so simple to operate and sensitive in action that all the attendant need do is to "set" the con-troller for the desired temperature or pressure and "forget it." Temperature ranges within 120° to 290° F.; pressure, 2 to 70 lbs.

Write for Bulletin A-388.

TAG Perfect TEMPERA-TURE CONTROLLERS:

Are operated by means TAG Self-Operaof compressed air and are ting Pressure Controller



TAG Perfect Automatic Temperature Controller



TAG Self-Operating Temperature Controller



TAG P & W. LIQUID LEVEL AND CONDEN-SATE CONTROLLERS:

TAG P. & W. Liquid Level and Conden-

sate Controller

Are unequalled for automatically maintaining the liquid level in evaporators, etc., at the exact height required; also for the effective discharge of condensate, the P. & W. Condensate Controller is superior to traps, etc.

Write for Bulletin A-406.

TAG INDUSTRIAL THERMOMETERS:

Are essential wherever accurate temperature readings are an important factor. Their permanent accuracy is guaranteed. Scale limits from -60° to 1000° F. above or Write for equivalent. Bulletin A-325.

TAG RECORDING THERMOMETERS:

For temperatures from TAG Industrial 60° F. to 800° F. or equivalent of self-contained and long distance forms. Write for Catalog A-345.



recommended where extreme accuracy is of vital importance. Supplied in various ranges from -40° to 900° F. or equiva-

lent. A similar controller for maintaining









TAYLOR INSTRUMENT COMPANIES

INDUSTRIAL DEPARTMENT

ROCHESTER, N. Y.

Manufacturers of a Complete Line of Instruments for the Indicating, Recording and Regulating of Temperature and Pressure

NRW YORK Bank of Metropolis Bldg., Broadway & 16th St. Sr. Louis Frisco Bldg., 906 Olive St.

BOSTON Room 921, Oliver Bldg., 141 Milk St. PHILADRUPHIA 705 Widener Bldg.

CHICAGO Heyworth Bldg., 29 E. Madison St. SAN FRANCISCO 431 Rialto Bldg.

BALTIMORE Lexington Bldg. TOPONTO

110-112 Church St.

TYCOS RECORDING THERMOMETERS:

Give continuous records of temperature. Made in both selfcontained and flexible tube form (mercury actuated and vapor tension types) for all industrial applications. t o

318 Range 40° 100° Fahr.

Tycos Recording Thermometer

TYCOS AUTOMATIC TEMPERATURE AND PRESSURE REGULATORS:



For processes requiring uniformity of tempera-Type "A" mus leave. Regulator ture or pressure conditions. trated above has a separable sleeve. can be removed from tank without drawing off

TYCOS "THERMO-TYME" TEMPERATURE REGULATOR:



Automatically controls the length of time required to reach a fixed temperature as well as controlling the temperature after it has reached this maximum. Espe-

nas reached this maximum. Espe-cially adapted to industrial applica-tions requiring a gradual increase of temperature to a certain point and then control at this point without fluctuation.

OURADVIS II MECHANICAL ENGINEERING

TYCOS INDUSTRIAL THERMOMETERS:



The underlying principle in the development of Tycos Thermometers is their adaptation to specific requirements. The wide experience gained in the course of over sixty years and a highly specialized manufacturing plant, enables us to design and produce the most practical and reliable temperature instruments for any purpose. The Tycos line includes thermometers for gas mains, superheaters, feed water pipes, condensers, brine pipes, air ducts, dry kilns, etc., in either straight or angle stems and with union or separable socket connections.

TYCOS PYROMETERS:

Are made in the following ranges Base Metal-0° to 2200° F. Rare Metal-0° to 3000° F.



AND FOSTER RADIATION PYROM-FERY A ETERS:

No upper limit of range. All forms furnished in single or multiple outfits,

Indicating or Recording.

All Tycos Recording Pyrometers furnish ink records on charts having rectangular coordinates.



TYCOS PRESS-URE RECORDERS:

Are built of the same construction as Tycos Recording Thermometers and are designed to handle either high or low pressure also for draft, vacuum a n d combination records.

GRIEBEL INSTRUMENT COMPANY

SUCCESSORS

CARBONDALE INSTRUMENT CO.

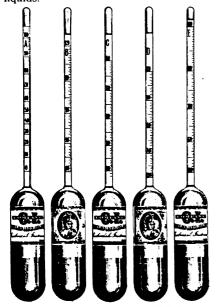
CARBONDALE, PA.

Manufacturers of Thermometers, Hydrometers, Glass Apparatus, Chemical Glassware and Laboratory Supplies

PRODUCTS:

Thermometers for Laboratory, Factory Ice Machines, Acid Plants, etc.

Hydrometers for light and heavy liquids.



SPECIALTY:

Beckmann Thermometers.

Immersion Calorimeter and all kinds of Normal Thermometers.

Send for Catalog.

Precision Volumetric Glassware graduated according to the specifications of the U. S. Bureau of Standards.



319

Burettes Pipettes Mohr's Pipettes Cylinders, etc. Chemical Glassware Chemical Porcelain Chemicals **Laboratory Supplies Biological Apparatus** Retorts Separatory Funnels Gas Analysis Apparatus Graduated Glassware Oil Testing Instruments Laboratory Hardware Asphalt Testing Apparatus Cement Testing Apparatus Sugar Testing Apparatus Water Testing Apparatus Instruments for testing the percentage of Alcohol.



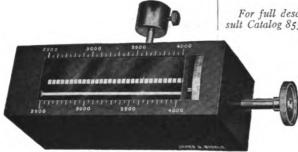
JAMES G. BIDDLE

1211-1213 ARCH ST., PHILADELPHIA

Industrial and Scientific Instruments

THE JAGABI VIBROMETER:

(Write for Descriptive Circular 915.)



fuges, turbo-blowers, dynamos, motors and all other machines that run at speeds between the limits above specified.

For full description and Price-List consult Catalog 855.

Simplicity of Mounting: No belt, gears, couplings or electrical connections are required—as it is only necessary to screw the Tachometer to a convenient part of the machine under test.

A new instrument for determining vibration of:

- (A) A machine under various conditions of adjustment—as of balance.
- (B) A machine under various conditions of operation.
- (C) A machine under ordinary conditions of "wear and tear."
- (D) Two or more machines.
- (E) Surrounding structures and buildings.

FRAHM VIBRATING-REED TACHOMETERS:

320

Frahm Tachometers are best suited for indicating speeds between 900 and 8000 R. P. M. For service outside these limits, a special actuating device must be used. After being thoroughly tried



out under long-continued service conditions, these unique tachometers are being used by all builders of steam turbines. In many cases they are included as part of standard equipment—and in others are specified by purchasing engineers. Their field of greatest usefulness includes steam turbines, centrifugal pumps, centri-

JAGABI HAND TACHOMETER Type C:

This instrument is directreading in revolutions - perminute, and is independent of the direction of rotation.

The tachometer, without accessories, weighs a trifle more than one pound, and is exceedingly convenient to use. It has a three-inch dial.



There is only one spindle, but each instrument combines three ranges—the change from one to another being effected by a gear-shifting device, controlled by a special slider.

We aim to carry the following in stock:

No. 226 Range 60- 240, 100- 400, 600- 2400 No. 231 Range 100- 400, 300-1200, 1000- 4000 No. 236 Range 150- 600, 500-2000, 1500- 6000 No. 241 Range 300-1200, 1000-4000, 3000-12000

Prices upon request. Ask also for Circular 395.

OTHER BIDDLE SPECIALTIES:

Megger Testing Sets and Bridge Meggers; Evershed Low Range Ducters; Laboratory and Portable Voltmeters Ammeters, Wattmeters, Shunts, Multipliers and Transformers; Frahm Vibrating-Reed Frequency Meters; Laboratory Rheostats; Etc.



THE ELECTRIC TACHOMETER CORP'N

PHILADELPHIA, PA.

95 LIBERTY ST., NEW YORK CITY

Manufacturers of TETCO Indicating and Recording Tachometers.

Portable, Stationary and Marine Types

Compared with tachometers operating on a mechanical principle, electric tachometers and especially TETCO TACHOMETERS, being of the Direct Current type, have the advantage of greater accuracy and long distance control. The Transmitter, a D. C. generator with permanent field, is geared or direct connected to the shaft, whose speed it is desired to record, or to any other shaft revolving at a proportionate speed; the indicator or recording instrument may be located at any distance away from the source of energy.



Combination Indicating and Recording Tachometer, Type M-200 AS. E.

The indicator or recorder movements are of the voltmeter type with scales calibrated in R. P. M. or proportional function, such as Miles per Hour, Production Units per Unit Time, or Time per Unit of Production.

The potential generated (i. e., the voltmeter reading) is directly proportional to the R. P. M. of the generator. Mechanical tachometers depend on different laws, generally centrifugal force.



Portable Tachometer, Type M-600 F

Transmitter and indicator are connected through a double conductor cable. Several instruments of the same type can be operated from one transmitter, or if desired, indicators and recorders, located at various distances from the source of energy. All recorders and indicators are guaranteed to be accurate within plus or minus 1%.

A great variety in indicators can be furnished, to suit different conditions. Two different types of portable tachometers (one of which is a hand type weigh, ing 3½ lbs.) are manufactured.



321

Marine Tachometer System for Twin Screw Vessel. 4 Indicators—2 Transmitters

The Electric Tachometer Corporation specializes in Marine and Naval Tachometers (approximately 250 U. S. Navy vessels have been fully equipped), tachometers for paper mills showing production of paper, tachometers for mechanical stokers of the Underfeed type, railroad tachometers and precision instruments for laboratory and general test purposes.



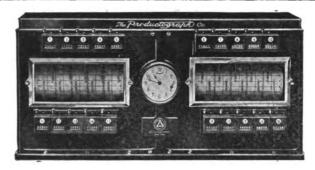
Send us data as to maximum speed, drive shaft diameter and distance required between drive point and indicator or recorder.

Literature sent upon application.

SLOCUM, AVRAM & SLOCUM LABORATORIES, INC.

120 PACIFIC STREET, NEWARK, N. J.

Manufacturers of the Productograph



The Productograph

"An Instrument for Recording Efficiency of Machines"

THE PRODUCTOGRAPH:

Gives an absolute and correct record 322 of lost time, productive working time, average speed and output, and it enables the Manager to put his hands on the weak links of his organization.

> COMPONENT RECORDING FEATURES OF THE PRODUCTOGRAPH:

> (1) Chart for recording total production, also productive and non-productive time. (2) Counter for reckoning total production.

> The Productograph proper and its accessories have a special advantage in that each accessory forms a unit in itself. This arrangement makes it possible to supply the instrument fully equipped or with any combination of recording features in order to meet the requirements of any type of plant.

> Description: The productograph is designed to graphically record a complete history of the operations of machinery in a plant irrespective of what is being manufactured. Special switches are installed on the different machines throughout the plant and from these switches wires are brought to the Productograph located in the central office.

> With this arrangement the operation of each machine is recorded, thereby providing accurate and immediate information covering the production and time loss of any machine in the plant.

The Productograph has been used in the following industries within the past | TRADE MARK

three years: Molding, printing, lithographing, cloth finishing, cloth printing, rope making, brick making, box making, screw making, textile manufacturing, shrapnel and motor car manufacturing.

To Engineers: At the present day of high cost of labor, it is essential that operation costs be minimized. The Productograph will give accurately a minute to minute record on every phase of an organization.

It is therefore essential that engineers familiarize themselves with this instrument, so that they may intelligently recommend its use whenever it can be advantageously used.

Irrespective of the nature of the requirements which may be desirable for any class of manufacturing plant, the Productograph is capable of executing the demands.

Further information will be furnished upon request, also data regarding:

- (1) The "Productograph Electric Counter" which counts the product or manufactured units by measurement or quan-
- (2) The Accumulator which records the actual producing time in hours, minutes and seconds of any machine in the factory, also denoting whether or not that machine is producing.

WESTON ELECTRICAL INSTRUMENT COMPANY

49 Weston Ave., WAVERLY PARK, NEWARK, N. J.

Manufacturers of Instruments for Every Field of Electrical Measurement

NEW YORK
CHICAGO
PHILADELPHIA
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AMSTERDAM
BUENOS AIRES
HAVANA

SEATTLE
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CINCINNATI
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RICHMOND

DUTCH EAST INDIES
MELBOURNE
HBLSINGFORS
SYDNEY
PARIS
BRUSSELS
GENEVA
BARCELONA
PERNAMBUCCO
REGINA

Weston



D. C. SWITCHBOARD FAN-SHAPED INSTRUMENTS:

comprise a group of switchboard instruments similar in shape but graded in size, which possess the standard Weston characteristics so familiar to engineers and manufacturers of electric equipment.

These instruments are particularly adapted to general switchboard practice because the various sizes of instruments available enable the manufacturer to select that one which will be the proper size to harmonize with the other apparatus on the switchboard.



PORTABLE ALTERNATING-CURRENT INSTRUMENTS:

of the electrodynamometer type possess all the characteristics required in a high-grade, accurate, portable instrument. They are accurate within ¼ of one per cent of full scale value on either direct or alternating current.

No matter what your requirements may be, state them and we will forward appropriate Bulletins.





EQUIPMENT CATALOGUED IN THIS DIVISION

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THE A. & F. BROWN CO.

Established 1854

Incorporated 1898

79 BARCLAY STREET, NEW YORK CITY

Works:

ELIZABETHPORT, N. J.

Engineers, Founders, Machinists and Millwrights. Manufacturers of Gears of all Descriptions, Turned Steel Shafting, Pulleys, Split Pulleys, Friction Clutches, Special Machinery, Etc.

CUT GEARS:

These gears are cut on the best up-todate automatic machines obtainable, enabling this department of the shops to turn out accurately cut gears of every description and size.



MACHINE MOULDED GEARS:

The Gear Department of our foundry is fitted up with the most modern gear moulding machines, enabling us to furnish machine moulded gears up to 16 feet diameter, and 25 tons in weight if in one piece, and heavier if split, or built up. These gears are much more accurate than ordinary cast gears and are of the toughest mixture of iron.

FRICTION CLUTCHES:

The F. Brown Friction Clutch is simple, compact and having few small parts is not liable to get out of order; engages gradually

and when thrown
"in gear" has a
stronger grip than
any other, owing to
the large friction
surfaces and powerful operating device
which is a com-



bination of double-ended (or right and left thread) screw and toggle joint.

327

SIRENS:

These fog signals are used by the United States Navy and Lighthouse Departments, also by a number of foreign governments and many steamships. They are also in use as fire alarm signals in small towns and large manufacturing plants.

COGSWELL MILL:

The problem of grinding or pulverizing many materials has been successfully solved by this machine.

SPECIAL MACHINERY:

These shops are particularly well equipped for building special machinery to plans and specifications. The pattern shop, foundry and machine shops are strictly up to date in all particulars and equally well equipped to turn out work

of the heaviest character as well as light machinery requiring first class material and workmanship and most modern tools.

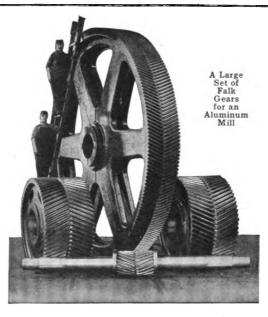


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THE FALK COMPANY

MILWAUKEE, WISCONSIN

Manufacturers of Precision Herringbone Gears with Staggered Teeth (Wuest Patents)



328

FALK HERRINGBONE GEARS:

We manufacture a complete interchangeable system of herringbone gears, with teeth generated on special machines, designed and built exclusively for our own use.

The gears which we produce are hobbed, both sides at once, in solid blanks.

The Wuest System of staggered teeth, besides giving the maximum contact surface for a given width of face, is invaluable in securing unbroken continuity of engagement when using high ratio pinions with very few teeth.

Other distinctive features:

Highest attainable accuracy.

Involute tooth form on circumferential section.

Invariable spiral angle.

Perfect interchangeability.

Equal efficiency in both directions.

Fig. 1

SPECIAL ADVANTAGES:

Long life.

High efficiency (loss never exceeds 1% at rated load).

Elimination of counter-shafts and double-gear trains.

Absence of vibration with prevention of shaft crystallization and breakdown of motor insulation.

Quiet action with durable steel pinions.

SIZES:

We manufacture hobbed herringbone gears in the following sizes:

Any pitch, from 10 D. P. to 34 D. P. Any face from 134 inches to 72 inches. Any diameter from 2 inches to 16 eet.

True spiral gears of constant angle cut to standard diametral pitch like spur gears.

Referring to illustrations, Fig. 1 shows a large set of Falk gears for an aluminum mill. Fig. 2 shows a high ratio double reduction gear unit for 3000 H. P. marine turbine drive—U. S. Shipping Board. Fig. 3 is a standard type of herringbone gear unit for motor-driven rolling mills.

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THE FALK COMPANY

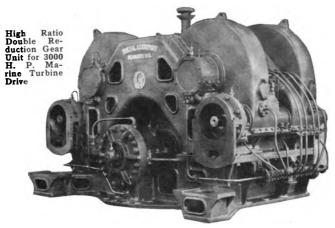


Fig. 2

FALK HERRINGBONE GEARS:

FALK HERRINGBONE GEARS transmit power by smooth, continuous action without jar, shock or vibration.

They are almost noiseless.

They can be used for extremely high single gear ratios. In this connection we make a specialty of forged pinions in one piece with their shafts. Ratios of 15 to 1 are quite normal and 20 to 1 may be used when necessary. Wuest gears can be run with safety at far higher velocities than the spur type. Special gears for use in connection with steam turbines are suitable for speeds up to 10,000 feet per minute.

Specially adapted for:

Marine Steam Turbines.

Oil Engines. Turbo-Generators.

Turbine-Driven Centrifugal Pumps,

Mills and Shafting.

Rolling Mills, Rod Mills and Sheet Mills. Tube Mills and Crushing Plant.

Power Pumps.

Air Compressors and Blowers.

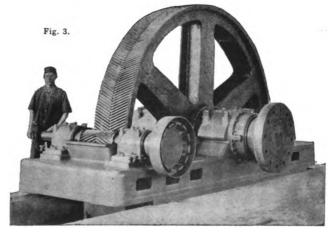
Hoisting, Elevating and Conveying

Plant.

Rubber Machinery.

Machine Tools.

The range of application for Falk herringbone gears covers every case where spur gears are used and many new fields where spur gears are impossible.



Standard Type of Herringbone Gear Unit for Motor-driven Rolling Mills

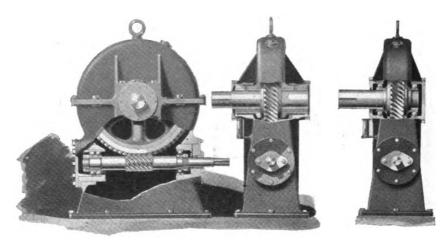
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THE CLEVELAND WORM GEAR CO.

CLEVELAND, OHIO

C. F. QUICKE & Co., 315 Euston Rd., London, N. W. Alfred H. Coates Co., 41 Spear St., San Francisco, Cal.

Manufacturers of Worm Gears and Worm Gear Reduction Units



Showing Worm Mounting, Ball Bearings

330 WORM GEARING:

The Cleveland Worm Gear Company is the only concern in America devoting its entire energies to the production of fine worm gears. It makes worm gears for use in motor trucks and tractors, and Cleveland Worm Gear Reduction Units for use in factories and anywhere that gear reductions are necessary.

Cleveland worm gears are of the straight type. The straight type worm maintains a constant pitch diameter over its entire surface, and the straight faced tooth offers no basic difficulty to accurate grinding of the flanks of the worm teeth to prevent distortion after hardening. This means uniformity of productionuniform superiority.

Back of Cleveland worm gears is an experience of more than twenty-five years manufacturing worm gears exclusively. No Cleveland worm gear has ever been returned to the factory because of faulty

CLEVELAND WORM GEAR REDUC-TION UNITS:

Cleveland Worm Gear Reduction Units are being used in hundreds of factories throughout the United States wherever speed reduction must be effected. They solve the problem with high efficiency and there is practically no cost of maintenance.

When designing new installations give the Cleveland Worm Gear Reduction Unit consideration as a factor of ultimate economy for all such purposes as are outlined above.

These units are manufactured complete ready for installation, but are built to suit the particular job.

We would be glad to correspond with engineers and others who desire the benefit of our MECHANICA broad and progressive experience in this field.





Cleveland Worm Gear for Trucks and Tractors

FAWCUS MACHINE COMPANY

PITTSBURGH, PA.

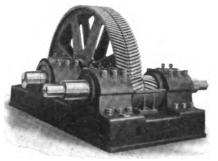
OFFICE First National Bank Bldg.

WORKS Pittsburgh and Ford City, Pa.

Cut Gears and Special Machinery

FAWCUS HERRINGBONE GEARS:

The purpose of Fawcus herringbone gears is to transmit power more quietly and more efficiently than is possible with



Fawcus Rolling mail Drive

spur gears. Gear and pinion teeth are cut in solid blanks on Fawcus patented hobbing and planing machines.

Opposite halves of each tooth are machined simultaneously, thereby obtaining maximum accuracy of tooth form, spacing and alignment. (Fawcus Patents.)

Correct construction demands that the two halves of each tooth be set opposite, the apex of the angle being in the center of the gear face. Face width must be so proportioned that teeth will have overlapping or continuous action, the minimum face width being about six times the circular pitch of the teeth for a standard helix angle of 23°. All teeth are cut to diametral pitch standards,

The accuracy of Fawcus gears makes possible their use for high peripheral velocities and large ratios of speed reduction. They may be advantageously used wherever a positive means of transmitting power is required.

twenty degrees involute short ad-

dendum.

The Fawcus Machine Company will gladly lend the best assistance of its engineering department in recommending and quoting on gearing for all purposes.

Valuable engineering data and additional descriptive information on Fawcus herringbone gears will be mailed to engineers and other interested persons on request.

PRODUCTS:

Cut Herringbone Gears

2 inches to 20 feet diameter.

Cut Spur Gears

2 inches to 20 feet diameter.

Cut Bevel Gears

2 inches to 48 inches diameter.

Cut Worm Gears

2 inches to 10 feet diameter.

Enclosed Worm Gears 5 H. P. to 25 H. P.

Flexible Couplings

For shafts 1" to 20" diameter

Special Machinery

Built to your order."

Standard Enclosed Herringbone Gear Drives

25 H. P. to 1500 H. P. (Herringbone Gear Booklet on request).

Special Enclosed Gear Drives 25 H. P. to 15,000 H. P.

Turbine Reduction Gears 25 H. P. to 12,000 H. P.

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OUR SPECIALTY:

Is making cut gears to your order. Give us your problem or send speci-We design complete transmissions. Our shop facilities are such that we can handle orders rapidly. We invite inquiries

on any kind or size of gear. The services of our engineers are at your disposal if needed.



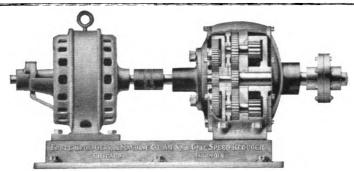


FAWCUS CORRECTLY CUT GEARING FOR EVERY SIZE OR STYLE OF CUT GEAR

FOOTE BROS. GEAR & MACHINE CO.

213-223 N. CURTIS ST., CHICAGO, ILL.

Manufacturers of Speed Transformers, Tractor Transmissions, Cut Gears of All Kinds



IXL Speed Transformer-Showing All Spur Gear Construction

FOOTE SPEED TRANSFORMERS: For Reducing or Increasing Speeds, Any Ratio.

Compact, entirely enclosed, oil tight, dust proof, perfect lubrication—saves power, prevents troubles caused by dust and dirt, prevents accidents-for cement mills, mines, etc.

332 Foote IXL Speed Transformers:

CASE—Cast iron, dust proof, oil tight, removable covers.

BEARINGS-Phosphor bronze, bushed throughout; designed for heavy duty and long life.

Pinions—Alloy steel, heat treated and hardened, giving great tensile strength. IXL Universal Coupling can be furnished to compensate any reasonable error in alignment of motor and transformer shafts.

DESIGN—The IXL Transformer is constructed along lines of a motor. Cast iron base furnished according to your blue prints at additional cost.

QUALITY—Designed and built to give perfect satisfaction.

Prices—On application. Send for full information.

Foote IXL Worm Gear Speed Transformer:

CASE—Cast iron, sand blasted inside, and coated with oil-proof preparation, oil tight and dust proof.

Worm—Made of steel.

WORM GEAR-Made of bronze or semisteel.

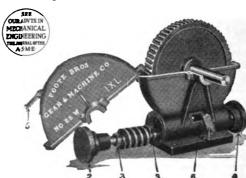
Oil Space—Ample system for properly oiling high speed worm shaft.

WORM SHAFT—Properly babbitted so worm and gear run freely.

BEARINGS—Large, providing for long life. Hyatt Roller Radial Bearings furnished at extra cost.

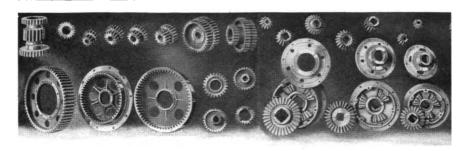
LOOK-IN-DOORS-Foote IXL Speed Transformers are the recognized standard for reducing or increasing speeds of machinery without the use of line shafting and belts. These transformers are made in all sizes, types and speeds for all purposes. Get the advice of our Engineering Department.





IXL Speed Transformer—Showing Enclosed Worm Gear

FOOTE BROS. GEAR & MACHINE CO.



FOOTE CUT GEARS—All Kinds for All Purposes:

Cut Spur Gears, Internal Gears, Racks, Worm Gears. Worms, Spiral Gears, Herringbone Gears, Bevel and Miter Gears

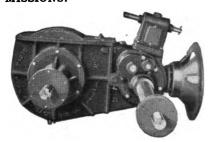
Our Rawhide Pinions and Bakelite Micarta Pinions are made from the best stock obtainable.

Hardened Gears made by our special process will stand the severe duty required on Farm Tractor Transmissions and heavy duty machinery.

Foote Dependable Tractor Gears are known the world over. These Gears are made to withstand the rigorous duty of tractor work with a good factor of safety. Foote Gears, Steering Gears and Differentials are built in all sizes and materials for all types of tractors. Prompt deliveries.

Send for general catalog on Gears, etc.

FOOTE FARM TRACTOR TRANS-MISSIONS:



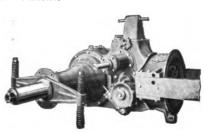
Model "B" Transmission is a heavy type for 3 plow tractors, 2 speeds, forward and reverse, bull pinion drive, specially heat-treated gears, Hyatt Roller Bearings, alloy steel shafts. Giving dependable service to thousands of tractors.

Model "C" Transmission, same design as Model "B" but made for 4 to 6 plow tractors, and for either 2 or 3 speeds.

FOOTE FARM TRACTOR TRANS-MISSIONS (Continued):



Model "D" Transmission is a 3 to 4 plow, heavy duty transmission with 2 speeds and reverse, and a pair of change gears outside of case, which can be reversed in position, giving two lower speeds if desired. Equipped with Hyatt bearings, alloy steel shafts. Enclosed working parts reduce maintenance and prolong the life of the tractor.



Model "D-U" Transmission, 3 to 4 plow live axle drive, planetary final drive, enclosed quick change gears outside of main housing. All working parts enclosed and run in a bath of oil. For 30 to 40 H. P. motors; can be supplied with driving spiders, cushion springs, drawbar, steering gear, engine and front axle supporting frame.

Model "F-U" Transmission same as, "D-U" Transmission, except built for 30 H. P. motors.

CONSULT FOOTE ENGINEERING SERVICE:

Foote Engineering Service has solved engineering problems for many manufacturers. This service is yours to consult freely and without obligation.

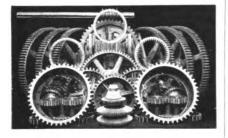
D. O. JAMES MANUFACTURING CO.

CHICAGO, ILL.

Manufacturers of Bevel, Mitre, Spur, Spiral, Bakelite and Worm Gears; Worm Gear Reductions; Speed Reduction Transmissions

CUT GEARS:

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We are specialists in the manufacture of cut gearing and are fully equipped with the most modern machine for the accurate production of large or small gears in any quantity.

We can furnish gears of every description, our facilities being unexcelled by any plant in the West. We have recently added extensively to our equipment and are better than ever prepared to fill all orders promptly.

Bevel Mitre

Spur Spiral

Bakelite Worm Gears

We can furnish them all

SEE OURADVIS IN MECHANICAL ENGINEERING INELOGRAL OF THE A S M E

and guarantee satisfaction

ENCASED WORM GEAR REDUCTIONS:

The worms are made of steel and the worm gear reductions are provided with thrust washers on each side of the worm, so the worm may be run in either direction. In the design of these reductions care has been taken to see that the worm and the worm shaft shall receive abundant lubrication.

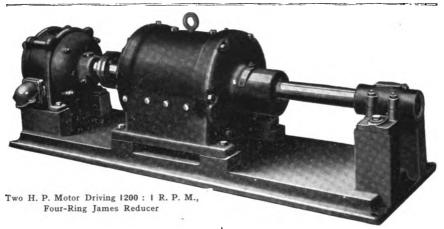


Points of Superiority:

- 1. The Worm Shaft is fitted in place at the proper center distance, so the worm and gear will run freely.
- 2. Particular care is taken to see that the worm and gear are cut and hobbed accurately.
- 3. The housing is constructed so the worm and gear may be easily removed. The worm may be removed by taking out the worm shaft bearings, and the worm gear may be removed by taking off the cap.

When properly installed and not overloaded but used for the horsepower as listed, our encased worm gear transmissions will give the utmost satisfaction. Each reducer is thoroughly tested before leaving our factory.

D. O. JAMES MANUFACTURING CO.



JAMES SPEED REDUCING TRANS-MISSIONS:

Ratios: 4: I to 1600: I I H. P. to 100 H. P.

Design and Construction:

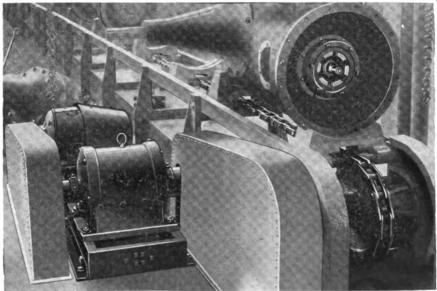
The James Engineering Department have, in the course of fifteen years' experience, perfected the James reducer to a maximum degree of simplicity and efficiency. The aim has been to design a reducer that will give the reduction with the fewest possible parts, combining a machine of greatest simplicity, strength and durability.

The James design makes a perfectly balanced unit, with all gears and moving parts running in the same direction in a bath of oil.

The drive is placed exactly in the center of the machine, feetly balanced outfit, vibration or shaking. In practically all cases the device is as noiseless as the motor.

All materials used in construction are of the finest grade, being selected with extreme care.

Write for our latest Bulletin No. 7 on Speed Reducing Transmissions.



James Spur Gear Reducer, Operating a Conveyor in the World's Largest Farm Tractor Factory at Detroit, Mich.

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W. A. JONES FOUNDRY & MACHINE CO.

CHICAGO, ILL. 4415 W. ROOSEVELT ROAD NEW YORK CITY 20 Murray St.

Manufacturers of Pulleys, Sprockets, Friction Clutches, Rope Drives, Cast Gears, Cut Gears, Speed Reducers and Power Transmission Machinery

JONES SPUR GEAR SPEED REDUCERS:

Are designed for reducing speeds between driving and driven units, and are adapted to practically all classes of Mill, Factory, and Plant equipment where reduction in speeds between electric motors and driven units are required. In outward appearance they somewhat resemble electric motors and are about

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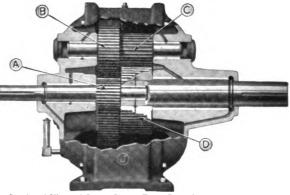
the same size as motors of the same horse power.

All parts of Jones Spur Gear Reducers are carefully made from the highest grade material. All gears and pinions are involute stub tooth, 20° pressure angle, accurately generated from special steel, are enclosed in cast-iron housings and run in a bath of oil, thus insuring perfect lubrication, long life and freedom from the injurious effects of abrasive dust, acid fumes, etc., in the surrounding atmosphere.

Jones Speed Reducers are Reasonable in Price.

Construction is Simplicity Itself.

Practically no Attention or Upkeep Required.



Sectional View of Jones Single Type Spur Gear Speed Reducer

Economize Space and Reduce Installation costs.

Comply with all Safety Laws.

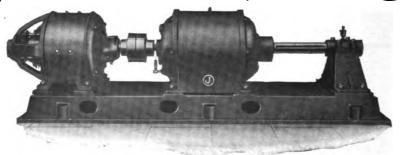
May be used on Floor or for Overhead Inverted Mountings.

Made in Sizes from 1 to 200 H. P. or over.

With practically any speed ratios up to 200 to 1 or more if required.

Our Engineering Department will gladly co-operate with you in analyzing your speed reduction problems and will aid you in selecting that machine best adapted to your particular requirements.

Write for Bulletin.



Jones Spur Gear Speed Reducer Mounted on Cast Iron Base

W. A. JONES FOUNDRY & MACHINE CO.

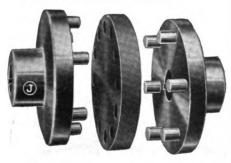
CHICAGO, ILL. 4415 W. ROOSEVELT ROAD NEW YORK CITY 20 Murray St.

Manufacturers of Pulleys, Sprockets, Friction Clutches, Rope Drives, Cast Gears, Cut Gears, Speed Reducers and Power Transmission Machinery

JONES STYLE "A" FLEXIBLE COUPLING:



Jones style "A" coupling consists of two cast iron flanges containing a number of steel pins evenly spaced near the outer edges. Between these flanges is a fiber disc in which are a number of equally spaced holes corresponding to and slightly larger than the steel pins, thus permitting a slight amount of float when the coupling is assembled, and automatic adjustment of the coupling to any slight misalignment between the connected shafts.



The style "A" coupling is well adapted for high speeds where the load is not subjected to sudden starting shocks, and is an ideal coupling for motor generator sets.

These couplings are of neat, compact design, are finished all over and accurately bored. There are no projecting bolts or other parts to cause accidents.

JONES STYLE "B" FLEXIBLE COUPLING:



The Jones style "B" coupling is the most flexible coupling on the market and will take care of greater shaft misalignment than the style "A." It also relieves the motor and driven mechanism of much of the vibration caused by a load of pulsating nature such as motor driven compressors, pumps, etc. It is absolutely noiseless in operation, requires no lubrication or other attention, and has no projecting parts to cause accidents.

This coupling is well adapted for motor driven fans and blowers as well as for heavy duty engine generator sets.



The steel pins of the style "B" coupling are connected by a flexible, oil-treated endless leather belt of specially selected stock. In selecting the proper sized belting for our various sized "B" couplings we have allowed a large factor of safety which insures for them a very long life. These couplings are suitable for transmitting loads of up to 500 H. P.

W. A. JONES FOUNDRY & MACHINE CO.

CHICAGO, ILL. 4415 W. Roosevelt Road NEW YORK CITY 20 Murray St.

Manufacturers of Pulleys, Sprockets, Friction Clutches, Rope Drives, Cast Gears, Cut Gears, Speed Reducers and Power Transmission Machinery

JONES STANDARD RIGID PILLOW BLOCKS:



In designing our standard rigid pillow blocks we have deviated considerably from the usual type of plain oiling bearings. Not only is the base finished, but the joint between the base and cap is accurately machined. The bearings are babbitted and accurately bored to size. In order to provide ample bearing surface for taking thrust from set collars, the ends of the bearings are of large diameter and face square with the bore. The oil holes are tapped to permit the use of grease cups if desired. Quantity production and modern manufacturing methods enable us to meet the prices commonly quoted on ordinary pillow blocks.

JONES UNIVERSAL ADJUSTMENT HANGERS:

These hangers are so designed that a wide range of adjustment in both lateral and vertical directions is secured within the frame. The bearings have unusually large oil reservoirs and combination ring and capillary oiling. All



bearings are babbitted, bored to size and the ends faced.

JONES DUPLEX OILING HANGER BOX:



The above cut shows a sectional view of our duplex oiling hanger box. The same oiling arrangement is used in our Duplex Oiling Pillow Blocks.

JONES RIGID DUPLEX OILING PILLOW BLOCK:



These bearings have the same duplex oiling device as our hanger boxes. The bearings are babbitted with a high grade babbitt, accurately bored to size and the ends faced and bottoms finished.

JONES STANDARD FLANGED COUPLINGS:

Jones Flanged Couplings are of such rugged design and construction that we guarantee them to transmit the full power of the connected shafts. These



couplings are finished all over; the bolt holes are drilled in jigs and reamed to size, thus insuring absolute interchangeability of parts. Turned coupling bolts are used, and keys are furnished.

Complete stocks of all sizes, including odd sizes and reductions.

W. A. JONES FOUNDRY & MACHINE CO.

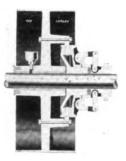
CHICAGO, ILL. 4415 W. ROOSEVELT ROAD NEW YORK CITY 20 Murray St.

Manufacturers of Pulleys, Sprockets, Friction Clutches, Rope Drives, Cast Gears, Cut Gears, Speed Reducers and Power Transmission Machinery

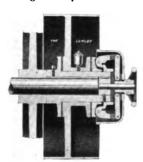
LEMLEY FRICTION CLUTCHES:



Lemley friction clutches are simple in construction, and positive and powerful in operation. The friction surfaces may be replaced without removing the clutch from the shaft.



LEMLEY clutches are made to meet both line and counter-shaft requirements as well as for gas engine work. They will meet your highest expectations.



IONES CUT AND CAST TOOTH GEARS:



We make a specialty of LARGE GENERATED GEARS. Every SPUR, WORM or BEVEL gear we cut is generated by the hobbing process. Our facilities for making these and planed 339 bevel gears are of the very best. The quality of our work and our prices should interest you.

We can furnish both the 141/2° involute tooth, or the involute stub tooth of 20° pressure angle at the same relative prices. Our large stock of spur, worm and bevel gear patterns enables us to make unusually prompt delivery and will save you the cost of patterns. Send for our gear catalog No. 19 which lists about 2000 of our standard patterns for cast tooth spur, worm, bevel and miter gears.

CAST IRON MACHINE **IONES** MOLDED PULLEYS:

JONES pulley service is nearly as well

known as the product itself. All pulleys are accurate l y bored turned and balanced, and are finished in a strictly workmanlike manner



NEW PROCESS GEAR CORPORATION

SYRACUSE, N. Y.

Manufacturers of Automobile Gears, Spiral Bevel Gears, Straight Bevel Gears, Spur Gears, Complete Differentials, Gears for Transmissions

This company has been making gears for 30 years and has concentrated on large scale production of gears for the automotive industry from the beginning of mechanical refinement in the automobile.

The New Process equipment for cutting spiral bevel gears is one of the largest in the world. We also have large capacity for straight bevels and spur gears for transmissions. We have 10 acres of floor space.

each is needed in the gears. Special machines are employed to prevent warping.

Thorough inspection at every stage is the final assurance of complete satisfaction. Manufacturers of automobiles, trucks or tractors may be sure that New Process Gears will fit with uniform exactness, thus limiting assembly-costs.

New Process engineers are at the service of automotive manufacturers to







Quality Work on Big Orders

For these gears we use selected grades of steel. Our engineers are experts in the designing of gears for the most economical performance.

New Process methods of machining the blanks and cutting the teeth secure the highest accuracy. Our heat-treating equipment is complete and our methods assure hardness and toughness where assist in the solution of their problems. Our experience has enabled us in some cases to point out weak spots in original layouts. Furthermore, big economies are sometimes available through taking advantage of complete gear designs already in production on quantity basis.

Quality Quantity

Quickness

R. D. NUTTALL COMPANY

PITTSBURGH, PA.

Manufacturers of Cut and Planed Gearing of Every Description



BP TREATED GEARING:

This treatment is an improvement over the older methods of oil quenching, and case hardening. It was developed for application to forged gears as a protection to them against the severer strains and shocks encountered in operation.

Forged steel gears have a naturally tough and destruction-resisting structure, but when in operation they are often worn much too quickly to permit the maximum economy possible. This natural condition makes BP gears very desirable for all classes of severe service, in which gearing is ordinarily employed as a means of power transmission.

HELICAL RAILWAY GEARS, TROL-LEY EQUIPMENT FOR RAILWAY AND MINE APPLICATION:

BP helical gears cut, treated and registered. Bronze trolley wheels for all services demanding this type of equipment, BP and NP gearing for mine locomotive and mine hoist applications.

Trolley poles of steel and wood for mine and industrial railways.

FLEXIBLE COUPLINGS:

Three types of Nuttall Flexible couplings:

"A" for 9 to 1340 H. P. and measures from 5" in diameter to 48".

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"B" for 93 to 4800 H. P. and measures from 13¼" to 78½".

"C" for 83 to 2680 H. P. and measures from $6\frac{1}{2}$ " to 52".

INDUSTRIAL GEARING APPLICATIONS:

BP gears for steel mills, blast furnaces, machine shops, etc.

Mining Gears:

Coal and Metal mining gearing of both the BP and NP grades.

Tractor Transmissions and Gear Train Combinations:

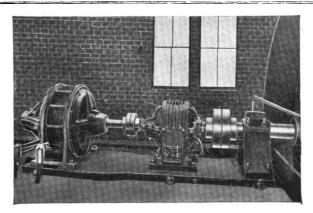
BP treated gears for all makes and capacities of tractors. Complete tractor transmission units ready for installation in the tractor or built to any specifications.

THE POOLE ENGRG. & MACHINE CO.

Established 1843

WOODBERRY, BALTIMORE, MD.

Manufacturers of Gears and Power Transmission Machinery



200 H. P. Turbo-Gear Line Shaft Drive

THE TURBO-GEAR (Fast Patents):

The Internal Herringbone Turbo-Gear is a patented, self-contained, mechanical power transmission interposed between, and directly coupled to the prime mover and the driven unit. It may be used as either a step-up or step-down speed-transforming device.

Gear Members:

The Turbo-Gear consists of a large, internal, double-helical gear made of a special-analysis, open-hearth, steel forging, heat-treated to increase its ductility and to insure uniform hardness. A double-helical pinion cut integral with the high-speed shaft, made of Halcombelectric furnace chrome-vanadium steel heat-treated to an elastic limit of 180,000 pounds per square inch and of proper hardness to minimize wear. Intermediate double-helical gears made of high-carbon steel forgings with large bronze bearings are mounted on hardened and ground, forged, steel shafts secured to the caststeel, slow-speed member.

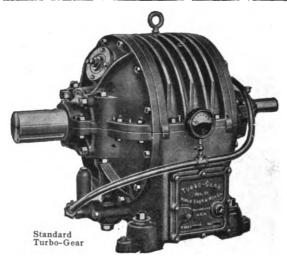
On this slow-speed member, which is part of the slow-speed shaft, are mounted two heavy-duty S. K. F. Ball Bearings, one on each side of the gears, and supported directly by the substantial housing. Thus it will be seen that the slow-speed member and shaft carrying the intermediate gears, and the high-speed shaft and pinion are independent of one another for support and yet each is supported directly by the housing. The internal gear is stationary, the moving members are the pinion and intermediate (planetary) gears.

The gear members in the Turbo-Gear are cut on a gear generator, specially designed for this purpose, that produces a true involute-shape stub tooth of unequalled accuracy and finish.

Reliability:

The Turbo-Gear is built for long service. It is rugged and compact, yet of ample proportion with low tooth pressures to resist overloads and shocks. as well as wear.

THE POOLE ENGRG. & MACHINE CO.



General Application:

Speed, efficiency and safety are the watchwords of the day. The Internal Herringbone Turbo-Gear meets all these requirements. It can be successfully employed for all kinds of gear drives, and used instead of the noisy, inefficient and highly dangerous methods of transmitting power through belts, ropes and chains.

Turbo-Gears are used with:

Motor Driven: Blowers, Centrifugal Pumps, Compressors, Conveyors, Line Shafts, Rubber Mills.

Turbine Driven: Centrifugal Pumps, Condensers, Fans, Generators, Rotary Pumps, Stokers.

Oil Engine Driven: Centrifugal Pumps.

Water Wheel Driven: Centrifugal Pumps, Exciters.

There is no type of drive which would not be made less noisy, more efficient and use less power by adopting this transmission.

Advantages:

High efficiency (98-99%).

Safety (no belts chains or sprockets, no exposed gears, no guards required). Freedom from noise and vibration.

Small floor space required.

Totally enclosed (can be used in wet, dirty, dusty, gritty places).

Simplicity (sprockets, chains, pulleys, belts, hangers, bearings, extra shafting, etc., eliminated).

Reversibility (can be used to either step-up or step-down the speed) and can drive in either direction of rotation.

Low first cost (lower than a complete gear, chain or belt drive).

Low maintenance cost (practically nothing).

No side strain on shafts or bearings (pure torque transmission).

Low erection expenses.

No subsequent adjustments needed. Once properly set up always thereafter in running condition.

Large speed-reduction makes possible the use of a higher-speed, cheaper, more efficient motor.

Wider range of speed reduction than any other single-reduction form of drive. Cool operation—sure proof of high efficiency.

All tooth pressures are balanced.

High- and low-speed shafts in axial alignment.

Each rotating member independently and directly supported by the housing.

Gears sprayed by a continuous stream of oil under pressure.

Three times as many teeth in constant contact as on any other form of Herringbone Gear drive for equal power. Consequently, low tooth pressure with corresponding increase of life.

Lighter weight per horse power than any other complete reduction gear.

Capacity:

The Turbo-Gear can be funished in any capacity from 2 horse power up.

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REEVES PULLEY COMPANY

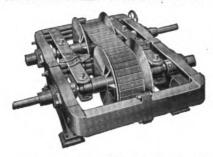
COLUMBUS, INDIANA

BRANCH HOUSE: Corner Clinton and Monroe Sts., CHICAGO

Sole Manufacturers of "The Reeves" Variable Speed Transmission, Wood Split Pulley, and Wood Split Pulley Clutch

The Reeves

VARIABLE SPEED TRANSMISSION:



Solves every problem of speed variation. It is a real speed regulator—one that may be applied to any machine and any desired speed secured in a moment, without stopping, not one revolution too fast nor one revolution too slow.

> The construction and operation are very simple. Two pairs of cone-faced discs are mounted on parallel shafts in such manner that they are movable. A special V-shaped belt drives from one pair of discs to the other. Two pairs of levers, operated by a right- and left-threaded screw, move the discs so that as one pair separates the other pair is brought together an equal distance thus changing the belt to different driving diameters and increasing or diminishing the speed of the variable shaft as desired. The speed is regulated by turning a hand wheel in one direction to increase and the other to reduce the speed. the speed.

> 'The Reeves' Transmission is used as a counter-You belt from the line shaft or motor to one shaft, which is driven at a constant speed, and the other shaft is variable. From the variable shaft you belt to the machine to be driven.

> The transmission is built in fourteen sizes to transmit from 2 H. P. to 150 H. P.; and seven classes to provide variation of 2 to 1 or as high as 10 to 1. It may hang from the ceiling, stand on the floor or be built into the machine it is to regulate. to regulate.

WOOD SPLIT PULLEYS:

"The Reeves" Wood Split Pulley is built of "The Reeves" Wood Spiit Pulley is built of hardwood, select grade, thoroughly air- and kilndried and acclimated. Each segment glued and doubly nailed; arms are placed edgewise to the load, extending through, built up and made integral with the rim.

The arms split the air—have less air resistance or disturbance than steel. The belt adheres to the face better than to steel or iron and trans-

mits from 20% to 30% more power with equal belt tension. 40% to 80% lighter than steel or iron, costs from 25% to 75% less, is stronger and more efficient in operation. Built any size from 3 inches to 30 feet diameter.

The Reeves" Wood Split Pulley should be used instead of metal ones because:

First: There is a saving of 50-75 per cent in weight.

Second: Saves money on power maintenance. Experts have demonstrated it costs \$100 per year to turn one ton of weight on a line shaft. Reeves saves 50 to 75 per cent of that.

Third: No defects in material possible in the laminated construction of Reeves pulleys, every piece being rigidly inspected. Can you be as sure of a cast pulley?

Fourth: With same belt tension they transmit 20 to 100 per cent more power than metal faced pulleys. (See Haswell's table in his "Engineers' and Mechanics' Mechanical Art.")

Speed and Safety: You are referred to page 823 of "Mechanical Engineer's Pocket Book," 2nd Edition, revised by Wm. A. Kent, A.M., M.E., an article on Wooden-Rim Fly-Wheels.

In comparing "The Reeves" w. Wood Split Pulleys note the following: with other

Perfectly clear stock in arm and rim.

An abundance of compression bolts, and each bolt right up against the shaft where it grips the best.

Each segment, inside and outside, double nailed and glued.

A perfectly rigid arm fastening. Arm built up with rim forming a part of same.

All stock pulleys from 6 inches to 60 inches diameter bored $3\frac{1}{2}$ inches, thus necessitating but one stock of bushing.

Bushing made in four pieces, insuring a better bearing on the shait—cannot shrink or swell.

Segments short, thus making not only a stronger getting out

rim but prevent-ing same from Each pulley fin-

ished in trans-parent orange shellac—as handsome as a piece of parlor furniture and will not discolor or fade when exposed to the light.

We also make Taper Cone pulleys, Step Cone pulleys, Flanged pulleys and Wooden Sheave pulleys.



THE BALDWIN CHAIN & MFG. CO.

WORCESTER, MASS.

Makers of Power Transmission Chains and Sprockets



BALDWIN CHAINS for transmission of power are made in two distinct types, block chains and roller chains.

Block Chains: Consist of solid steel blocks of section resembling either the letter B or figure 8, each separate block drilled to receive two revoluble studs to which the side links are attached; also furnished in riveted type. This class of chains is adapted to comparatively light work where the lineal speed of the chain does not much exceed 800 feet per minute.



All Baldwin Block Chains, except No. 5, are made detachable. They are as durable and as strong as the riveted chains of the same size. The value of the detachable feature of these chains is proved by the increased demand for them by the trade who find them very convenient for the ease with which they can alter the length of a chain to suitable requirements, either for changing the gearing or for quick repairs.

Roller Chains: As their name indicates consist of rollers mounted upon hollow shafts technically called bushings, a pair of which is fitted in to side links to form the equivalent of the solid block used in the block chains. These built-up blocks are then connected by rivets or studs to other side links. The

connection is either made permanent by riveting or made separable by using studs provided with cotter pins at one end. The fastening to be selected will depend |

upon the nature of the work to which the chains are applied, or to individual prefer-

This style of chain is adapted to the heaviest work and if properly lubricated is capable of standing up under a lineal speed as high as 1,200 feet per minute, or under exceptional conditions somewhat higher.

Cotter Pin Detachable Roller Chain:

Baldwin Cotter Pin detachable chain can be easily separated at each link, and is well adapted

for heavy motor trucks.

The side links on one side of the chain are riveted to the ends of the studs, and on the other side of the chain, the links are forced on to the studs, and retained by a cotter pin.

Riveted Roller Chain: The material used in the manufacture of these chains is carefully selected and particular attention is paid to the heat treatment given it. The neck of the rivet

treatment given it. The neck of the rivet is a driving fit knurled and forced into the side link by power. This makes a connec-tion that is superior for all requirements.

Baldwin machine-made roller and block chains are suited for a great variety of chain drives. It is our business to furnish estimates for chains and sprockets for various drives.

SPROCKETS:

We have a large department equipped with the best facilities for the accurate and economical production of sprockets, in large quantities as well as for sample lots. No order is too small to interest

us, or too large for us to handle.

We cut sprockets from any of those materials which appear to be best



adapted for wear in the particular work they called upon to do.

DIAMOND CHAIN & MFG. CO.

INDIANAPOLIS, U.S.A.

Makers of High Grade Chains Since 1890

The "Diamond" line of high grade steel block and roller chains offers a correct chain for every need of power transmission. It includes 70 models, ranging from ½ inch to 2-inch pitch and from ½ inch to 1¼ inch width.

SOME OF THE MANY MACHINES USING DIAMOND CHAINS:

Motorcycles, Bicycles, Automobiles, Motor Trucks, Farm Tractors and Marine Engines (for Final Drive, Fan Drives and Starter Drive).



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Farm Tractor with Enclosed Diamond Chain Final Drive

Farm Machinery, such as:

Binders Ditchers Ensilage Cutters Balers Spreaders Potato Diggers Sprayers Threshers

Tractors



Dismond Chain Drive on AMERICAN Laundry Machine

Industrial Machinery, such as:

Automatic Lathes
Bag-Making Machines
Can-Making Machinery
Clay-Working Machinery
Concrete Mixers
Cordage Machinery

Drill Presses
Elevators and Hoists
Laundry Machinery
Milling Machines
Mining Machinery
Power Conveyors
Power Hammers and
Pumps

Printing Machinery Locomotive Stokers Screw Machines Shoe Machinery Street Sweepers Textile Machinery
Tire Machinery
Wood Working Machinery and many
others.
Wrapping Machines

Also for Motor-to-Line-Shaft Drives in factories.



Diamond Chains used for Motor-to-Line-Shaft
Drive

ADVANTAGES OF DIAMOND CHAIN DRIVES:

Give positive speed ratio between driving and driven shafts.

Operate with high efficiency; cut out slippage.

Provide great flexibility—absorb shocks and strains. Sprocket centers easily adjusted.

Reduce friction—the power load is distributed over *several* teeth—not concentrated on *one* point.

Low in initial cost and upkeep. Long life. Great strength and reliability. Permit quick, easy repairs.

Diamond Chain engineers, backed by thirty years' experience, will gladly cooperate with you. Send us sketch of proposed drives, with details as to speed, H. P., and location, and get their recommendations.

SPECIAL SPROCKET SERVICE:

Our Sprocket Department is equipped to produce highest grade sprockets in all sizes. Prompt delivery and fair prices. Send us your specifications and let us estimate on your sprocket requirements.

MORSE CHAIN COMPANY

ITHACA, N. Y.

ADDRESS NEAREST OFFICE

BALTIMORE, MD., 1402 Lexington Bldg.
BOSTON, MASS., 141 Milk Street
CHICAGO, ILL., Merchants Loan and Trust Bldg.
CLEVELAND, OHIO, 421 Engineers Bldg.
DETROIT, MICH., 1003 Woodward Ave.
GREENSBORO, N. C., 805 Ashboro Street
NEW YORK CITY, 50 Church St., Hudson Term.
Bldg.

PHILADBLPHIA, PA., 302 Harrison Bldg. PITTSBURGH, PA., Westinghouse Bldg. SAN FRANCISCO, CAL., Monadnock Bldg.

ATLANTA, GA., Earl F. Scott, M.E., 702 Candler

Building
CANADA, Jones & Clasco, Reg'd, Montreal, St.
Nicholas Bldg., Toronto, Bank of Hamilton

KANSAS CITY, Mo., Morse Engineering Co., Finance Building

MINNEAPOLIS, MINN., Strong-Scott Mfg. Co., 413 Third Street, S. St. Louis, Mo., Morse Engineering Co., Chemical Building

Product:

MORSE SILENT CHAIN 99% Efficiency



frictionless "Rocker Joint" Morse Morse Irictioniess Rocker Joint Stlent Chains and Sprockets—a high speed, positive, and flexible drive of many and varied applications, which maintains an efficiency of over 99% by actual test, a claim that can be made by no other manufacturer of silent chains. From 14 H. P. to 5,000 H. P. For High or Low Speed

Difference:

Difference:

The difference between the Morse Silent Chain and all other types is in that unseen and all-important part, the joint. The MORSE is constructed with the undeniable fact always in view—the joint must bear the burden of service in any chain. Instead of a single pin, as in other joints, two special pins, both seated, form the joint. No bushing is required. As the chain bends in circling each sprocket, the curved side of one pin rolls or rocks against the broad, flat side of the other, eliminating destructive sliding friction entirely. When on the straight run between sprockets, the flat sides of both pins are brought together, holding the chain steady and true.

Speed and Service:

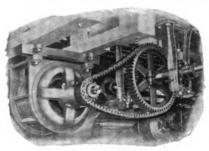
This exclusive "Rocker Joint" construction enables the MORSE to run at a speed far in excess of other chains because lubricant is not essential to its operation; and after years of experimentation (in nearly every line of industry) it is accepted as the most durable chain



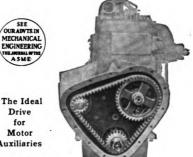
Engineering Assistance:

Our corps of engineers with years of experience in designing and installing millions of horsepower chain drives will assist you to solve your transmission problems.

This service is rendered gratis. Get in touch with them NOW.



Overhead Line Shaft Drive



Auxiliaries



The Largest Chain Drive in the World: thousand H. P. Morse Silent Chain Drive from water wheels to generator, Ox Bow Hydro-Electric Plant, Snake River, Copperfield, Ore.

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AMERICAN PULLEY COMPANY

4200 Wissahickon Ave., PHILADELPHIA

BRANCH STORES:

NEW YORK BOSTON 33-35 Greene St. 165 Pearl St. CHICAGO SEATTLE 114-116 S. Clinton St. . 536 First Ave., So.

San Francisco 14 Natoma St.

Wrought Steel Belt and Sash Pulleys and Pressed Steel Shapes

AMERICAN PULLEYS

More Than Five Million "AMERICANS"

Now in Service

Guaranteed for Double Belt Service

Repeated tests run by engineers of the highest standing have shown that American Steel Split Pulleys will transmit more power with less belt slip than cast iron, wood or other steel pulleys. Data will be furnished on application.

They are about half as heavy as cast iron pulleys, designed for equal service, and save the power required to rotate the unnecessary dead weight of the latter.

348 It takes one horse-power to rotate each ton of weight on shafting.

Tests have shown that, where the arms of pulleys fan the air, it costs sometimes almost a dollar more per pulley per year to rotate them than it does to rotate the American Steel Split Pulley, the arms of which cut the air.

The manufacturers will cooperate with engineers wishing to arrive at the actual facts as to efficiency, putting their testing apparatus at the disposal of the inquirers.

AMERICAN STEEL SPLIT PULLEYS

All "American" Pulleys above 6 inches in diameter have a grooved face.

Listed sizes 3" to 120" in diameter. Crown and Straight faces. Interchangeable bushings.

No set screws and no keyways unless for unusually heavy duty.

Stocked by over 290 dealers in the United States and Canada.

All pulleys fully guaranteed.

Catalog on request.



(Patented) 3", 4", 5" and 6" DIAMETERS

Note the sturdy construction. These small pulleys are as perfect in their way as larger "American" Pulleys. No more can be said.



(Patented)
INTERMEDIATE SIZES

Provided with grooved air escape. Six flat "A"-braced arms (edge on) give great rigidity and least air resistance. Riveting the ends of the arms to inner flange means a round pulley, strong where strength is needed.



(Patented)
44" TO 82" DIAMETER

Larger diameters up to 120" with faces wider, than 16", of similar design—with more arms and stronger hub. Grooved air escape.

CROWN OR STRAIGHT FACE

THE W. E. CALDWELL CO.

Established 1884

340 East Brandeis St., LOUISVILLE, KY.

Manufacturers of Friction Clutches and Power Transmission Machinery

CALDWELL FRICTION CLUTCHES:



Caldwell Friction Clutch Pulley

The notable features of this clutch are its simplicity, strength, ease and perfection of adjustment and freedom from breakage.

The basic principle is identical with that of the standard automobile service brake; a flexible band, lined with asbestos and tightened with a lever. In practice it has given equal service with that much used and abused device.

There are only eleven parts. All are designed to have their greatest strength in the direction of the greatest stress and all small parts are of steel.

There is only one adjustment. One screw shortens or lengthens the band and gives all the adjustment necessary. This is so simple that it can be easily and correctly maintained by anyone.

Most clutch breakages are caused by having one of several adjustments too tight and thus causing one part to carry the entire load instead of the one-fourth or one-sixth that it was designed to carry.

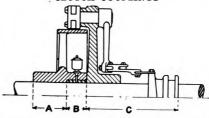
This cannot happen with the Caldwell clutch. It is therefore immune from this as well as a number of other clutch troubles.

It is easy to operate as the lever is moved by a toggle link which gives increased power as the stress increases. This and the fact that the band grips the entire circumference of the friction ring gives it great pulling power.

We furnish the Caldwell clutch in the form of friction clutch pulleys, gears, sheaves or sprockets, as cut-off couplings or with an extended hub so that a separate pulley, sheave, sprocket or gear can be attached.

When not specified we furnish a bronze tube bushing but we recommend our cast 349 split removable phosphor bronze bushing.

DIMENSIONS OF CALDWELL FRICTION CLUTCH COUPLINGS



iameter Clutch Inches	oower 000 M.	igs of a	est re res	Space on Shaft in Inches				
Diamet of Clute Inches	Horsep at 10 R. P.	Swings Inside, Inches	Largest Bore Inches	A	В	С		
8 10 12 14 16 18 20 22 24 27 30 36 42 48 54	1 2 4 6 10 13 21 26 32 38 48	107/8 127/8 16 18 21 23 251/2 271/2 303/8 323/8	22333444555556	21/2 21/2 31/8 35/8 4 1/2 43/4 5 5 3/8 6	11/2 11/2 2 2 21/2 21/2 3 3 31/2 31/2	714 714 918 938 1114 1134 1334 1538 1534		
30 36 42 48	60 105 145 190 240	36 38 39 ½ 46 78 52 78 61 ½ 67 34	51/2 51/2 61/4 71/2 8	634 71/2 81/4 9	5 5 6 6	18¼ 20¾ 21½ 24 24 24¾		

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DODGE SALES & ENGINEERING CO. Distributor of the products of

DODGE MFG. CO., MISHAWAKA, IND.

15 Branch Warehouses in the United States. Dealers in Every Representative City Designers and Builders of Everything for the Mechanical Transmission of Power

In these days when "DELIVERY" is considered of equal importance with "QUALITY," there is a double reason for your specifying "Dodge" pulleys.

there is a double reason for your specifying "Dodge" pulleys.

DODGE PULLEYS constitute the standard of the world in design, strength, interchangeability, service and prompt delivery.

Dodge "Independence" Wood Split Pulleys are 40 per cent to 80 per cent lower in price than any pulley made from any kind of metal.

They will stand up under any double belt service and will run successfully at any practicable speed.

ticable speed.

Dodge Wood Split Pulleys are guaranteed. If they fail in any way to satisfactorily perform the function of a stock pulley, they may be re-turned and full credit will be allowed.



"Independence" Wood Split Pulleys independence wood Split Pulleys are lighter, stronger, steadier, than any other pulleys of their type; they insure the maximum tractive pull of belts and are guaranteed to give satisfactory service.



The Dodge "Standard" Iron Split Pulley is America's ideal service pulley. It is easily put up or taken down, and will fit shafting of all regular sizes There are no rivets to shear or joints to work loose.

The Dodge "Standard" Iron Split Pulley is impervious to the weather, to water, to steam or acid fumes.

The Dodge "Standard" Iron Split Pulley does not become distorted under strain; it is perfectly round and gives a full 100 per cent belt contact.



Split iron center wood rim pulley-for shock loads, heavy service high speeds.

Split Iron wood pulley double center rim with arms, espe-cially adapted for high speed, heavy a n d shock loads.





The Dodge Interchangeable Bushing system makes possible the application of a pulley to any size of shaft within the range of standard

standard bores as fol-lows:

3" diameter 3" diameter
4" diameter
5 to 7" diameter
8 to 23" diameter
24 to 48" diameter
50 to 72" diameter

1½" bore 2 " bore 2 " bore 2 1 " bore 3 " bore 3 1/2" bore

Bushings for Standard I ron Splits are made and finished whole, then cracked, and the fractured edges

are dressed away slightly to provide for proper clamping clearance.
Two complete bushings are required

for each pulley, one for each end of the pulley hub.



DODGE SALES & ENGINEERING CO.

Distributor of the products of

DODGE STEEL PULLEY CORPORATION

Main Office: MISHAWAKA, IND.

Steel Pulley Plant at ONEIDA, N. Y.

Steel Split Pulleys

ONEIDA AND KEYSTONE STEEL SPLIT PULLEYS:

Are now sold exclusively by the Dodge Sales and Engineering Company. The marked superiority of these steel pulleys over all similar products is at once evident to any one familiar with pulley construction.

Both Oneida and Keystone pulleys possess the true oval crown rim which makes for greater uniform belt contact, because of the absence of a groove at the point of greatest tension, such as is found in other types of steel pulleys.

Uniform belt contact because-No Groove-OVAL CROWN

OVAL CROWN

Face of Palley

No belt contact at this point of greatest tension.

Angle crown gives ineffectual contact here.

Rue of Palley

Valuable literature on the subject of steel pulleys will be sent to anyone on request.



The New "Keystone" Steel Split Pulley

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Throughout the construction of both Oneida and Keystone pulleys, wherever two pieces of metal are riveted together, these metals are counter-locked male and female so that there is positively no shearing or lateral strain on the rivets.



"Oneida" Steel Split Pulley

Oneida and Keystone pulleys are made in all sizes up to very large belt wheels for main engine drives.

NATIONAL STEEL PULLEYS:

Are made in 3, 4, 5 and 6" diameters, 3" to 6" faces, and fill a long-felt want for a strong efficient, satisfactory small pulley.

The National pulley has all the advantages of the bushing system, and, being instantly available from dealer's stock, has attained wide popularity.



"National" Steel Split Pulley

National pulleys are suitable for use on small motors, dynamos, wood or metal working machinery, and, in fact, in all places requiring small well-balanced, efficient pulleys.

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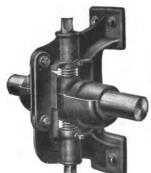
DODGE SALES & ENGINEERING CO.

For pleasing appearance, ample strength, wide adjustability, easy erection, perfect alignment, and general mechanical quality there has never been produced an equal to the DODGE DOUBLE BRACE, BALL-AND-SOCKET HANGER, made in both "drop" and "post" styles.



The Dodge Drop Hanger is ball-andsocket in its fitting.

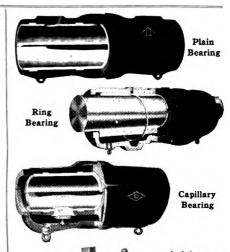


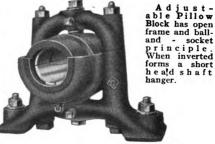


A d j u s table Ball-and-Socket Post Hanger with Standard and Self-oiling. Bearings. Ample adjustment; machined base.

Designed for the utmost strength in form and proportion, it is nevertheless of pleasing appearance in its lines of symmetry and its distribution of metal. To the mechanical eye, these features are all quite in harmony, each having its share in creating and sustaining an impression of confidence in the general excellence.

In the new Dodge Catalog the subject of hangers and bearings is discussed fully. Correct engineering tables are given as well as suggestions for a wide number of uses of hangers; pillow blocks, floor stands, etc.





Capillary
and Ring-oiling Rigid Pillow Blocks
adapted to the
most severe
service. May
be ordered
with dust-proof
ends.





Common Flat Box for use under conditions where moderate powers are involved and where heavier self-oiling equipment is unnecessary.

"DODGE" BEARING METAL is intended for use under all general conditions, the "Copper Hardened" brand

being better suited for places where there is considerable vibration, knock or pound to con-

EASABASES

tend with.

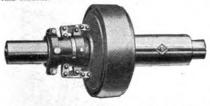
Our "Genuine" brand is intended for use in bearings where heavy crushing strains are involved. We make a brand of metal for every service condition.

DODGE SALES & ENGINEERING CO.

THE DODGE SOLID FRICTION CLUTCH:

Is particularly adapted for countershaft use, and other places where a solid type of clutch can be advantageously employed, and where the power requirements are within the range of capacities offered in this style of construction.

Any kind of a pulley—wood, iron center wood rim or iron, and either solid or split—or any gear, sprocket or sheave wheel, can be used upon this clutch.



Rated Capacities of Dodge Solid Friction Clutches when Operating at Speeds Shown

				9	Secon	DHOME	•	1			_	-
	-	R	Speed	Maximum Bore								
Size of Clutch	100	150	200	250	300	350	400	450	500	Maxi	Reg.	Spec.
4° 5° 6° 7° 8° 9° 10° 12° 14° 16°	H. P. 114 2 3 4 5 6 10 15 30 50	H. P. 176 3 4 6 7 9 15 22 45 75	H. P. 21/2 4 .6 .8 10 12 20 30 60 100	H. P. 31/8. 5 7 10 12 15 25 37 75 125	H. P. 314 554 812 11 14 17 28 43 85 142	H. P. 4 614 9 12 15 19 31 47 95 157	H. P. 41/2 7 10 13 17 20 36 51 102 170	H. P. 5 8 11 15 18 22 39 59	H. P. 51/2 9 12 16 19 23 40	600 580 560 540 520 500 480 440 360	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4° 5° 6°

DODGE PATENT | SPLIT FRICTION CLUTCHES:

Make possible two things of great importance and value:

(1) The easy and ready installation of the equipment upon a shaft already in place without taking down the shaft or disturbing any of the equipment upon same, and

(2) The greatest possible facility in the taking off of old parts and the substitution of new, in the event that any



Rated Horse Power Capacities of Dodge Split Clutches

Size of Clutch	RE	VOLU	TIO	NS P	*Maxim	Maxi-				
	100	150	200	250	300	350	400	C. I. Sleeves	Bab. Sleeves and Quills	Bore
10 12 14 16 18 20 22 24 28 30 36 42	H. P. 6 10 15 20 25 32 40 50 80	9 15 22 30 37 48 60 75 120	H. P. 12 20 30 40 50 64 80 100 160	H. P. 15 25 37 50 62 80 100 125 200	H. P. 17 28 47 57 71 91 114 142 228	19 31 51 63 79 100 126 157 252	H. P. 20 34 51 68 85 109	250 250 250 250 250 250 250 250	450 440 430 420 410 400 390 380 360 350	25/2 31/2 41/2 5 6 6 6 7 7 7 1/2
36	98 128 174	147 192 261	196 256 348	245 320 435	280 365 495	309			325 300	10
48 54 60	242 340 480	363 510	484 680 960	605 850	:::				275 250 225	10 12 12





Dodge Split Friction Clutch with Dodge Split Iron Pulley.

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THE DODGE PATENT SPLIT FRICTION CUT-OFF COUPLING:

Is used for the purpose of connecting together two sections of shafting in such way that one section can be stopped or started at will while the other section is operated continuously.

Th mechanism of the Dodge Patent Split Friction Cut-Off Coupling is the same as is employed with the friction clutch for use with pulleys, gears, sheaves or sprockets. Instead, however, of the extended loose sleeve, a hub part is used, which is keyed to one of the shafts and provided with a bronze bushing for receiving the extended part of the other shaft to which is keyed the driving plate of the mechanism.

The subject of clutches is an important one and is fully described in the Dodge Book C-16, in addition to other special literature devoted to the subject. It will be sent on request.

(See pages 46, 47 for additional products of this Company)

THE FALLS CLUTCH & MACHINERY CO.

CUYAHOGA FALLS, OHIO

(SUBURB OF AKRON)

Shafting, Shaft Couplings, Flexible Couplings, Collars, Bearings, Hangers, Pillow Blocks, Base Plates, Floor Stands, Head Shaft Hangers, Countershafts, Pulleys, Sheaves, Friction Clutch Couplings, Friction Clutch Pulleys, Belt Tighteners, and a Complete Line of Power Transmission Machinery

BRANCHES WITH COMPLETE STOCKS

NEW YORK, N. Y. 206-208 Fulton St.

BOSTON, MASS. 52-56 Purchase St. CINCINNATI, OHIO 134 W. Second St.

WESTERN SALES OFFICE SCHWARZ ENGINEERING Co., 310 Mack Bldg. DENVER, COLORADO

FALLS FRICTION CLUTCHES:

The "Falls" Friction Clutch was presented to the mechanical field over thirty-five years ago when large power units were first being developed and its adaptability for all classes of service has placed it in the foremost position up to the present time of being the strongest, most reliable, efficient, and simplest clutch on the market.



The assembled parts, consisting (of either four 6 Arm F. C. Coupling 354 friction jaws gripping the friction ring with counter-acting force and operating in machined guides on the clutch arm, actuated by powerful independent toggles which are saft-looking either in or out of clutch provides are self-locking, either in or out of clutch, provide a mechanism that is powerful, flexible, self-con-tained, easily operated, adjusted and maintained. and always in condition to start from rest to full speed the most delicate to the heaviest dead load in the time limit desired.

> The ''Falls''
> Friction Clutch is rnetion Clutch is made in a complete range of sizes for Friction Clutch Cut-off Couplings, Friction Clutch Pulleys, Extended Hub Friction Clutches for Gears, Sprockets, Pulleys Sprockets, Pulleys, Sheaves, or Special Mountings, Gas Engine Friction Clutches, Counter-shaft Clutches, Double Throw or Duplex Friction Clutches, Quills and any variety of special Clutches, installations



4 Arm F. C. Pulley

ROPE DRIVES:

We are specialists in designing and equipping rope drives for any and all classes of service.

Manila Rope Drives of either American or Continuous Rope System, or English or Multiple Rope Sys-tem. Wire Rope Drives and Special She ives.



Multiple Rope Sheave

CAST IRON PULLEYS:

Cast Iron Pulleys for any installations: Solid or Whole, Clamp Hub, Split, Double Arm, Tight and Loose, Flanged, Step Cone, Taper Cone, Conveyor Head and Tail, Heavy Rim, Fly-wheels, Motor or Generator, and specially designed.



Split Double Arm Pulley

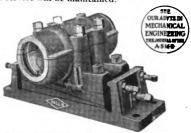
BEARINGS:

Falls bearings have always been manufactured to withstand exceptional service and with our complete line of Drop Hangers, Post Hangers, Bracket Hangers, Head Shaft Hangers, Countershaft Hangersand Accessories, Pillow Blocks, Base Plates and Floor Stands. bearings for all installations from the light countershaft to the heavy mill



Adjustable Ring Oilin Double Braced Drop Hanger Oiling

drive can be selected with assurance that maximum service will be maintained.



Heavy Rigid Ring Oiling Pillow Block on Wedge Adjusting Base Plate

SHAFTING AND COUPLINGS:

Complete stocks of shafting of standard drawn or turned and hammered forged stock.
Shaft Couplings of all types and any service, either in rigid or flexible types.

We maintain an up-to-date Machine Shop, fully equipped, and have our own foundries, enabling us to specialize to your Transmission Equipment requirements,

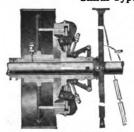
THE HILL CLUTCH CO.

CLEVELAND, OHIO

NEW YORK SALES OFFICE, 50 CHURCH STREET

A Complete Line of Power Transmission Machinery for Belt and Rope Drive, Including the Patented Hill Friction Clutch (Smith Type) and Collar Oiling Bearings, Special Machinery, Gray Iron Castings

HILL FRICTION CLUTCHES: Smith Type



Sectional View Hill Clutch Pulley

(Smith Type)—(Patented) Built solid or split in sizes from 9 to 1300 H. P. at 100 R. P. M.

The Smith Туре Hill Friction Clutch is the latest design of the wellknown Standard Hill Fric-Clutch tion which has manubeen factured by us for the past thirty-six Viseyears. like jaws grip the ring in pairs, actuated

by a powerful toggle mechanism. No springs are used. Clutch is self-centering and in a cut-off coupling no alignment bushing is required, so when clutch is disengaged there are no revolving parts in contact.

In specifying Hill Friction Clutches, call for the improved Smith Type Hill Clutch to insure your obtaining the latest design and a clutch of great mechanical stability and large starting power—two essential features in successful friction clutch design.

HILL COLLAR OILING BEARINGS: Cleveland Type



Sectional View Hill Collar Oiling Bearing Cleveland Type, Patented

In the Hill Collar Oiling Bearing, instead of depending upon a loose ring or chain for conveying oil to journal, a fixed collar is employed, thus providing a positive means of elevating the oil that never fails.

In the Cleveland Type Collar Oiling Bearing oil stored in a reservoir in the bottom of the bearing is continuously elevated by a heavy split collar. Metal wipers deflect the oil which is then distributed along the full length of the journal.

Starting from rest two or three revolutions of the shaft are all that is necessary to completely flood the bearing and thereafter journal operates on a continuous, unbroken film of oil, eliminating wear on the babbitt and creating very high efficiency. The oil collar also acts as a thrust collar, thus eliminating the necessity of using outside shaft collars unless the end thrust is very severe.

HILL ROPE DRIVES:

American and English Systems of Rope Drives designed, built and installed.

HILL CLUTCH AUTOMATIC BELT TIGHTENER:



Hill Clutch Automatic Belt Tightener Patent Applied For

The Hill Clutch Automatic Belt Tightener automatically takes care of the slack in belts under varying loads. It reduces belt tension and the friction load on bearings. It increases the capacity of an overloaded belt by preventing slip. It is especially good for short centers and high belt speed.

The reason for its effectiveness lies in its ability to automatically wrap the belt more or less around the pulley where slip may occur.

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THE CARLYLE JOHNSON MACHINE COMPANY

MANCHESTER, CONN., U. S. A.

Manufacturers of Friction Clutches, Cut-off Coupling Clutches,
Marine Reverse Gears, Marine Motors

THE JOHNSON FRICTION CLUTCH:
A Small, Compact, Light Powered
Clutch for Use on the Overhead Shafting
and as a Part of All Designs of Machinery

Our Black Catalogue sent free-Write now



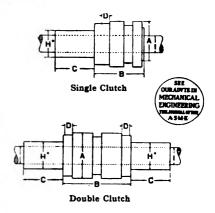
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Section Broken Away, Showing Clutch Disengaged

Construction: As seen by the illustration, this type of Clutch has but few parts and is very compact. A body fastened to the shaft carries a split ring in which are inserted a pair of levers. A curve-shaped wedge, which is made part of a shipper sleeve, forces the levers apart, expanding the ring, bringing its outer surface into frictional contact with the inner surface of the friction cup, the hub of which is made to suit requirements.

The leverage is so compounded that it requires but little pressure to operate the Clutch.

One screw which moves two taper blocks, set into the levers, adjusts the contact of the ring and cup to any tension. This is easily reached with a screwdriver, through hole in the friction cup. The perfectly smooth shipper sleeve entirely encloses working parts so no dirt can get into them. The Double Clutch requires but little more space than the Single, and has two friction cups with hubs, on which can be mounted pulleys, cones, gears, etc., of any diameter and face.



DIMENSIONS OF STANDARD SINGLE AND DOUBLE CLUTCHES

1 Size er	power P. M.	Bore		Dime	nsions	w to En- Clutch	nt of ard Clutch	ard h	
Clutch Numbe	Horse 100 R	Max. of Clu Body.	A	Single B	Double B	С	Throw	Weigh Stand Single	Weigh Stand Doub Clutch
0 2 4 5 6 8 10	3/4 1 1 1/2 2 2 1/2 3 4	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3 15" 4 158" 4 158" 5 168" 5 168" 7 158" 9 168"	3 14 " 4 14 " 5 14 " 5 15 " 6 14 1 5 " 6 17 6 "	5 6 未" 7 ½" 8 未" 8 ½" 11 ½" 8 ½" 10 击"	3 " 4 " 512" 6 " 612" 813" 813" 813"	1 " 1 1 " 1 1 1 " 1 1 1 1 1 1 1 1 1 1 1	10 lbs. 12 lbs. 19 lbs. 27 lbs. 35 lbs. 53 lbs. 75 lbs. 130 lbs.	20 lbs. 25 lbs. 32 lbs. 43 lbs. 54 lbs. 96 lbs. 110 lbs. 150 lbs.

^{*} Diameter of hub "H" must be at least 1" larger than shaft diameter. If a self-oiling bearing of any kind is used it must be at least 1¾" larger. The hub length "C" can be furnished in any dimension on special order.

MEDART PATENT PULLEY COMPANY

Engineering Sales Offices PHILADELPHIA CHICAGO

ST. LOUIS, MO.

211 Vine Street CINCINNATI

Specialists, not Alone in Pulleys, but Manufacturers of Every Appliance for Use in Connection with the Mechanical Transmission of Power, Including Turned and Polished Steel Shafting

MEDART

LINE SHAFTING EQUIPMENT:

Founded forty years ago, with the Medart patented Steel Rim Pulley as the nucleus, our business has experienced a gradual well-planned development in the single field of making complete equipment for the mechanical transmission of power, and in building Machinery also for straightening, turning and polishing round bars of steel, bronze, copper, etc. Today the name "Medart" is synonymous with "EVERYTHING in Line Shafting Equipment," and "the best Machinery for straightening and turning round metal bars," particularly of steel.

Although common impression, due to our corporate name perhaps, has been that the name "Medart" means "Special-ists in Pulleys alone," the facts are that Pulleys—every type: Cast Iron, Wood Split, and Steel Rim-constitute only a small percentage of our production, and we are importantly engaged in manufacture of Turned and Polished hafting, Couplings, Collars, Bearings, Bearing Supports, Steel Shafting, Hangers, Friction Clutches, Gearing, Rope Sheaves, Belt Tighteners, American and English System Rope Drives and so on. In fact, we cover the mechanical transmission field, and have fully equipped some of the largest and best known plants that are noted for high efficiency.

SHAFTING:

That we are the only exclusive Manufacturers of a complete line of power transmission machinery which manufactures shafting in our own mill, on a basis permitting us to quote Mill Prices, is something Engineers and Buyers should keep in mind when securing proposals covering tentative Line Shafting installations. Shafting in any considerable overhead equipment comprises a heavy percentage of the total tonnage involved. Hence, we are able to quote very attractively covering all Line Shafting Equipments. It will be to your great advantage to secure all your overhead equipment from one source of supply—at a saving.

'Medart" Shafting is produced by the Turning and Polishing process.

TRANSMISSION APPLIANCES:

Our Flange Couplings are all male and female design. We fit them to shafts under hydraulic pressure and afterwards face off to insure true alignment. Also we offer Compression keyed-on, Three-part Keyless, Universal Joint and Jaw Clutch type Couplings.

Our line of Hangers and Bearings and Bearing Supports includes different types, all heavy and well designed. Hanger Frames are of the 4-Way Adjustment types. Bearings are either Ring, Collar or Wick Oiling or fitted with Grease Cups —adapted for Ball and Socket or Screw Adjustment. Pillow Blocks of every style, including Base Plates, Wall Boxes, Floor Stands, Brackets, etc.

Our V-Groove type Friction Clutch, having an interchangeable Sleeve to which may be fitted either a Pulley, Gear, Sprocket or Rope Sheave, made solid or split construction, is noted for its great strength, matchless frictional 357 power, simplicity and long life in service. Is adapted for conversion to Cut-off Couplings.

PULLEYS:

Our Steel Rim Pulley-light in weight, perfect in balance—is superior to any possible construction of pressed and riveted sheet steel, because stronger, stiffer, and will stay round. Made all sizes up to 16 feet diameter and 50 inches face. Our equipment for manufacture of Cast Iron Pulleys, 3 inches to 16 feet diameter, is complete from the best foundry conditions and the most modern types moulding machines to the highest efficiency in machine shop practice. Medart Wood Split Pulleys do the work and they'll last as long as the shafting will last.

Our heavy duty "Hercules" all-steel pulley is matchless. It'll withstand successfully more abuse than any other make or construction of pulley. They are built to suit specific conditions, and guaranteed on a money-back basis.

Gears: It doesn't matter what you need in Gears—we can build them. have thousands of patterns, and, besides, the most efficient moulding machines and

gear cutting shop equipment.

Send for our General Catalog and
Discounts. Let us quote your next specifications.

T. B. WOOD'S SONS COMPANY

CHAMBERSBURG, PA.

Manufacturing Engineers, Power Transmission Machinery

SHAFTING:



Showing Different Forms of Keyseats

We are prepared to furnish shafting of the best steel in diameters up to 24°, made perfectly round and straight, thereby insuring easy running and also minimum loss of power.

SAFETY SET COLLARS:

These are made either Solid or Split, bored to fit any size of shafting. Finished all over and fitted with hardened Set Screws. Constructed so that all bolts and Set Screws are protected by flanges projecting beyond heads and nuts. The heads of all Clamping Bolts in Split Collars are slotted.



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Safety Set Collars

We also supply Concealed Fast Collars forged from bar steel, bored slightly under size, shrunk on shaft, then turned and finished on shaft centers, thereby insuring a true running collar.

COUPLINGS:

This line consists of Flange or Plate Couplings, Male and Female, or Standard Plain Face type. Double Cone and Universal Giant Compression Couplings, the latter being the Coupling that requires





Universal Giant Compression Coupling

no keys. Ribbed Compression Couplings, Shifting Jaw Clutch Couplings, either Spiral or Square Jaws, Solid Sleeve, Universal Joint Couplings, and Flexible Couplings.

HANGERS:

Our line consists of many different types of Hangers all of a modern design, possessing unique adjusting and powersaving features, fitted with Ring Oiling, Chain Oiling or Plain Grease Cup Bearings.

We are also prepared to equip Hangers with Closed End Bearings and Bearings recessed for Collars. This line comprises Line Shaft, Heavy



Hanger

and Extra Heavy Head-shaft Drop Hangers, Post Hangers and Bracket Hangers, all being made in both the Ball and Socket and Four Set Screw or Peerless Type.

We also supply Adjustable Girder Clamps of a unique design, Countershaft Parts or Complete Countershafts.

PILLOW BLOCKS, ETC.:

From our many different patterns we are prepared to supply Rigid and Adjustable Pillow Blocks suitable for operation under various conditions. This classification comprises Plain Flat Boxes,

Standard Rigid, Wick, Ring and Chain Oiling Rigid Pillow Blocks and Post Hangers; Solid Journal Boxes, Ball and Socket and Four



Pillow Block

Set Screw Ring Oiling Adjustable Pillow Blocks; also Plain or Wedge Adjustable Base Plates; Cast Iron and Steel Arch Wall Frames; Cast Iron Wall Brackets, Plain and Wedge Adjustable Ball and Socket Floor Stands, and Fire Wall Sleeves.

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T. B. WOOD'S SONS COMPANY

PULLEYS:

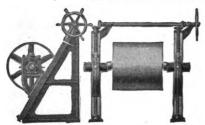
We manu-Cast **facture** Pulleys Iron only, of a correct design having metal properly distributed. same being carefinished fully and balanced.



This type of pulley we believe superior to others as it is permanent and suited to a wider range of service. We are prepared to furnish Cast Iron Pulleys of every description.

BELT TIGHTENERS, ETC.:

This line comprises Belt Tighteners made with "A" Frames and Vertical Side Frames, all with Screw Adjustment; in addition, Rack and Pinion Tighteners



Belt Tightener

for Horizontal or Vertical use, also swinging tighteners. We are also prepared to furnish Stationary and Adjustable Mule Pulley Stands, Single and Double Brace Binder Frames and Guide Pulleys.

UNIVERSAL GIANT FRICTION **CLUTCHES:**

These Clutches are of the Disc Type, of a consistent design throughout and are made either solid or split, the same type of construction being used for all sizes



Universal Friction Clutch Pulley Pulleys,

and all speeds. The Clutch is complete within itself either for use as a cut-off coupling or for use in connecwith tion ordinary Gears, Rope Sheaves, Sprockets or any regular or special part that it is desired to use as a driving or driven mechanism.

The Sleeve and Body of this Clutch being independent, both are held rigidly in lateral position upon mounting and sustain no end thrust whatever when clutch is thrown in or out of engagement. The Friction Surfaces are protected from dust, dirt and other foreign substances. If desired, Clutch may be equipped with special cover to protect mechanism. .

CLUTCH BELT AND SHIFTING MECHANISMS:



which may be attached to any of our Hangers. We also furnish for Friction Fork Clutches, and Lever Stands, Compound

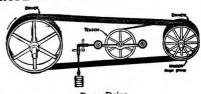
We supply

Belt Shifters

Compound Lever Shifter Stand

Levers, Worm Geared and Single or Double Spur Geared Shifter Stands.

ROPE TRANSMISSION:



Rope Drive

We are prepared to make complete installations of either English or American System Drives, and also to furnish Rope Sheaves with Grooves of every description; Tension Carriages, Track, Track Hangers and Tail Rope Sheaves.

We have at your command Engineers who have had years of experience in designing and installing satisfactory Rope Driving Equipments, whom we will be glad to have plan MECHANICAL

drives to meet conditions as they may exist.

ENGINEERING ASME

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SAUER POWER GENERATING CO.

5115-19 ROSETTA ST., PITTSBURGH, PA.

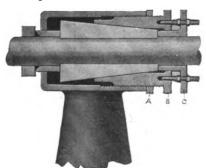
Manufacturers of the Sauer Adjustable Shaft Bearing, the Sauer Transmission Gear, Steam Jet Blower

THE SAUER ADJUSTABLE SHAFT BEARING:

(Patented Dec. 10, 1907.)



SAUER ADJUSTABLE BEARINGS save power—increase profits—in every line of industry where bearings constitute a part of the plant equipment. They reduce friction losses, make possible higher speeds and heavier feeds, thereby increasing the output, the true measure of efficiency. The Sauer Bearing is of a standard form, possessing the special advantages of simplicity of construction, easy adjustment of center and side motions while running, and the elimination of liners, oiling grooves and shaving or fitting.



The Sauer Adjustable Shaft Bearing can be fitted to every hanger, post hanger and pillow block of a corresponding size in your plant.

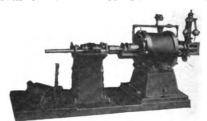
The only wearing parts of the bearing are the adjustable blocks which are made either of Babbitt metal or bronze.

The Sauer Adjustable Shaft Bearing, in design, weight, durability, as well as dependability, is the most satisfactory bearing for all high speed machinery where accurate running is required: such as in the case of Turbines, Generators,

Motors, Emery and Buffing Wheels, Machine Tools, Crank Shafts, Loose Pulleys.

Write for Further Information and Prices.

THE SAUER TRANSMISSION GEAR:



For varying the speed of turbines, motors, and practically all machinery where an increase or decrease of speed is required, the Sauer Power Generating Company furnishes a transmission gear by which the speed can be changed easily while the gears are running. The device consists of a high and a low speed shaft and one or two countershafts, the two former being in one straight line but disconnected.

It is claimed that the gear will transmit twice as much power as another gear of the same width and strength, since the power is transmitted on two sides and by twice as many teeth. Among the special features of the gear are that side and end thrust are eliminated from both the driving and the driven shafts and the gears are very compact, requiring only a small amount of space in proportion to the power transmitted.

Our engineers are at your service in solving your transmission problems.

STEAM JET BLOWERS:



Our Steam Jet Blowers form a high degree of vacuum and can be used consequently as suction as well as for injection.

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BOUND BROOK OIL-LESS BEARING CO.

BOUND BROOK, NEW JERSEY

Specialists in the Manufacture of Oil-less Bushings for more than a Third of a Century

BANISHING THE COSTLY RESULTS OF NEGLECT:

The heavy toll exacted by neglected lubrication points out the need for a safeguard that will protect the remote and inaccessible bearing points of machinery against sudden wear and breakdown when grease cups are overlooked.

"Bound Brook" (graphite and bronze) and "Nigrum" (impregnated wood) Oilless Bushings, while not designed in all cases to be used without the usual method of lubrication, are so constructed as to afford complete insurance against the serious results of neglect. They have a self-contained lubricant, built into them at the factory, and whether attended to or not they will continue to render service longer than any other type bushing.



Oil-less Bushings have been installed with gratifying results on motor cars, truck and tractor chasses, textile machinery, washing machinery, baking machinery, water filtration machinery, tobacco machinery, sand blast machinery, conveying machinery, pumps, trolley wheels, elevating machinery, gear cutting

machinery, steam turbines-in fact, whereever bushings are used.

"Bound Brook" Oil-less Bushings are constructed of high-grade phosphor bronze just like any other good bushing. On their bearing surfaces there are cast symmetrical grooves or trenches, varying in design according to the purpose for which the bushings are to be used. By means of hydraulic pressure these grooves are packed solid with a special hard lubricating graphite. The graphite and bronze surfaces are flush; they wear evenly; they require no refilling.

"Nigrum" Impregnated Wood Oil-less 361 Bushings are made of hard, seasoned wood which is thoroughly impregnated with a specially prepared lubricating compound that never gives out. This is attained by a patented process resulting from years of study and experimentation.



There is no machinery of any kind that will not be more fully insured against trouble by the use of "Bound Brook" or "Nigrum" Oil-less Bushings.

Bound Brook Engineers will gladly study your lubrication problems and point out a method for their solution.

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THE BUNTING BRASS & BRONZE CO.

720 SPENCER ST., TOLEDO, OHIO

Manufacturers of Bearings, Bronze and Babbitt Lined



REGISTERED B. B. & B. CO.

This company serves automobile, truck, tractor and general machinery manufacturers with finished bronze bushings and bearings; also babbitt lined bearings.

Bunting operations are in two general divisions:

First—Bearings made to the customers' 362 dimensions and alloy specifications, in lots of 50 of a kind or over.

Bunting Bushings cost buyers less than their own costs for rough castings machined in their own plants-due, of course, to the specialization and economies that accrue in our great factory which is devoted solely to one type of manufacture. We make and



list over 10,000 standard bushings and bearings and consequently save our customers the costs of new patterns and tooling up.

Second-We also make up in advance in big production runs and

Fig. 1 carry in stock 134 sizes in Bunting Phosphor Bronze Straight Dimension Bushings (type illustrated, Fig. 1). The size range is from $\frac{5}{4}$ to $2\frac{1}{16}$ inches inside diameters and from $\frac{3}{4}$ to 5 inches in length. From this stock we fill orders, usually the day received, at prices much lower, even on small orders, than could possibly be quoted under any other conditions.

This service is so unusually advantageous that many are changing their bushing dimensions slightly, where necessary, in order to conform to our standards and use this service as a source of supply,

As a buyer's reference we furnish a Card List of Bushings "In Stock," showing not only the sizes but the standard oil holes and grooves available. Stocks are carried at the Toledo factory and

also at the following branches: lowing Cleveland, 1302 6th Street; Chicago, 722 South Michigan Avenue; New York, Grand Cen-Palace, tral care International Factory Appliance



Exposition. We also make Cored Bars and supply them from the factory or any of the branch offices.

General Data—Bunting Bushings are longer wearing because harder bearing surfaces are obtained by a patented and exclusive treatment-on an average bushing the Scleroscope will show a reading of 30 on Bunting Bushings, against 18 for a bushing of ordinary make.

All bushings are accurate and finely finished, ready for assembly—no losses to the customer for defective or imperfect items, no expense for patterns, tools or errors in production—as is the case when he makes his own.

We maintain a finely equipped laboratory where all incoming metals are analyzed and standards checked. At present, we have on file 107 alloy compositions that are met with absolute accuracy—a feature of extreme importance because a variation of as little as

one per cent in tin, lead or zinc frequently entirely changes the character of an alloy.

really Our mendous output and finely organized facilities enables us to accept a great volume of business and still meet the delivery requirements of our customers.



We work from blue prints, accurate dimensions or correct samples—prints preferred.

Quotations upon request—a'so Stock List "M."

JOHNSON BRONZE COMPANY

NEW CASTLE, PA.

SALES OFFICES: New York, Pittsburgh, Detroit, Chicago EXPORT OFFICES: J. E. Dockendorff & Co., 20 Broad St., New York City The Parker Company, 165 Broadway, New York City England, France, Italy, Japan, Switzerland, Spain, Holland and Belgium Scandinavian Countries: Norway, Sweden and Denmark

Manufacturer of Bronze Bushings, Babbitt Lined Bearings, Automotive, Tractor, Car and Locomotive-Mill Bronzes

AUTOMOBILE BUSHINGS:







We carry in stock large quantities of standard automotive bushings and are, therefore, prepared at all times to give your requirements-whether large small-prompt attention and service.

As we are at the present time serving a great many of the largest automobile manufacturers, a large part of our plant is devoted entirely to this particular type of bushing-we will be glad to quote on your requirements.

TRACTOR BUSHINGS:



We are prepared to furnish this type of bushing in any quantity, machined or rough. These bushings used in the assembly of tractors and adopted as the standard by many of the leading manufacturers, are noted for their high compressive strength.

They are especially made to withstand the uneven strains and severe shocks of the open fields. Our best attention and service will be given to your inquiriessend us your blue prints for trial order.

BABBITT LINED BEARINGS:



Babbitt Lined Bearings have been found invaluable to those manufacturers who require an unusually high speed bearing—one that will resist friction for a longer period and give greater uninterrupted performance than is expected of the ordinary bearing. To this class of manufacturers Johnson Babbitt Lined Bearings are giving unusual service day in and day out.

Send us your blue prints and specifications. We know that we can product, dependable deliveries MECHANICAL and perhaps better prices. Why not write us today?

SEE

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AUBURN BALL BEARING COMPANY

Established 1893

22 ELIZABETH STREET, ROCHESTER, N. Y.

Manufacturers and Engineers

Ball Bearings for Every Service



BALL THRUST BEARINGS:

Auburn Ball Thrust Bearings are made in standard and special designs to answer specified end-thrust conditions of rotating machine parts. The Auburn Four Point Cone Contact Principle groove, illustrated by our trade mark above, reduces friction and wear between balls and races. Heavy races, large balls, the best alloy tool steels properly heat treated and accurately ground, combined with our cooperation in selecting bearings, insure the best answer to your problem.





Enclosed Style T-100 Single Thrust

Auburn Enclosed Style T-100 Ball Thrust Bearing is a self-contained and protected type for use in exposed places. It is made in standard sizes from 1/2" shaft up. Send for list of sizes.



Open Style T-114 Single Thrust

Auburn Open Style T-114 Ball Thrust Bearing is a self-contained type for use inside the machine where it may operate in a bath of oil if desired. It is made in standard sizes from 16 shaft up. Write for bulletin.





Double Thrust Aligning Thrust

When machine parts do not preserve alignment, Style T-170 Spherical Seated Thrust Bearing answers the problem. Where there is double thrust to be cared for, we provide the single unit T-150 Style bearing. If a difficult bearing problem is encountered in machinery design or operation, send us full details with sketches and get the Auburn Answer.



Bearing Problems Answered

Bearings designed and made to meet unusual service conditions, Thrust Bearings, Annular Bearings, Races, Washers and Rings of tool steel, manufactured to customer's specifications. Send Blue Print for quotation.





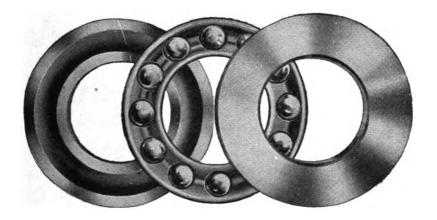
Balls of Steel, Brass, Bronze, Aluminum, Cork and other materials, solid and hollow, for bearings, tumbling barrels, valves and for special purposes. Inquiries solicited.

THE BEARINGS COMPANY OF AMERICA

LANCASTER, PENNA.

WESTERN SALES OFFICE 1012 Ford Building, Detroit, Mich.

Manufacturers of Ball Thrust Bearings, "Star" Ball Retainers, Drop Forgings



Manufacturers of

"STAR" BALL RETAINERS

for

Thrust

Magneto

Cup and Cone

Types of Bearings

Complete

BALL THRUST BEARINGS

made

to your requirements

Also manufacturers of

Drop Forgings

LOAD AND DATA SHEETS:

For the use of engineers in laying out bearings we have compiled a set of data sheets showing various sizes of Ball Retainers we manufacture for Cup and Cone, Thrust and Open Side Radial type bearings.

We will gladly send these data sheets to any engineer requesting them.

We stock no bearings but manufacture .
them to order only.

Send us blue print of bearing desired, showing how it is to be mounted. Give us the quantity of bearings wanted and we will be pleased to quote you accordingly.

Digitized by Google

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BOWER ROLLER BEARING CO.

DETROIT, MICHIGAN

Manufacturers of Bower Roller Bearings

BOWER BOULER BEARING CO. R Detroit Michigan

The flange idea, applied exclusively by Bower to bearing design, is essentially the same principle that introduced a new element of safety into rail travel. It has been accepted for years as the highest standard of bearing practice by the better automobile makers.

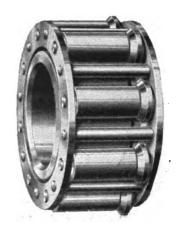
Because years of adoption by manufacturers and engineers have proven the
366 exclusive Bower principle to be sound practice, there has never been a radical change in the design of the Bower roller bearings.

And yet they are acknowledged by the industry to be just as standard and just as far in advance of their time as they were 10 years ago.

The Bower principle allows the use of a larger diameter or roller. It makes higher spindle speeds possible and lessens the possibilities of wear.

Bower Roller bearings are radially non-adjustable, a feature that is immediately appreciated by all engineers.

The end thrust can always be regulated without changing the radial alignment



of the shaft. Best of all, actual wear is practically negligible after years of hard service.

Its Long Life is the prime feature that has allied Bower so solidly with the better designers and manufacturers in the automotive industry.

Exclusive Bower Features

Separate bearing surfaces for load and thrust.

Parallel raceways.

Self-aligning, never need adjusting.

Does not develop end thrust under loads.

Will not bind or end-slip.

THE FAFNIR BEARING COMPANY

Conrad Patent Licensee

NEW BRITAIN, CONN.

DETROIT OFFICE: 752 David Whitney Bldg.

CHICAGO OFFICE: 1301 So. Michigan Ave.

CLEVELAND OFFICE: 916-917 Swetland Bldg.

Manufacturers of Ball Bearings

COMBINED RADIAL AND THRUST LOADS:

How They Are Carried by Several Types of Bearings.

Not only is the high-grade ball bearing so nearly frictionless as to make it virtually wearless, but it affords the only efficient means of carrying combined radial and thrust loads, as is shown below.



I. Roller Bearing—Thrust carried by plain washers with great rubbing friction.



2. Roller Bearing—Thrust carried by shoulders with pure rubbing friction.



3. Fafnir Angular Contact Ball Bearings—All loads carried by balls with minimum friction. Note that load line of balls corresponds to resultant of radial and thrust components of total load.

367



4. Fafnir Radial and Thrust Ball Bearings—The radial ball bearing floats and carries radial load exclusively, the thrust ball bearing carries the thrust load. All loads carried by balls with minimum friction.

All types of Fasnir Ball Bearings embody the best that is to be had in workmanship and material.



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GURNEY BALL BEARING COMPANY

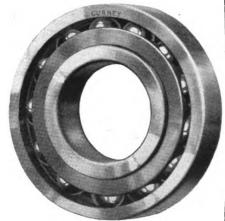
Conrad Patent Licensee

JAMESTOWN, N. Y.

Ball Bearings with Exceptionally Large Load Capacities Bearings of Annular Type for Combined Radial and Thrust Loads

All Ball Bearings Look Alike to the casual observer.

But before selecting a ball bearing to suit his requirements, the careful engineer will investigate the inherent qualities the degree to which the design and con struction has been perfected, and determine whether the mechanical principles of the bearings are fundamentally correct. After such inquiry he will choose



GURNEY BALL BEARINGS

because they are built on mechanically and mathematically correct principles

because maximum load capacity per ball is obtained by virtue of the concentric and highly perfected race contour (no filling slots to weaken rings) because the use of a maximum in number and size of balls is possible on account of the patented, unique method of assembling

because higher load capacity per bearing is obtained, due to the large number of balls used

because both radial and thrust loads

can be carried on a single row of

balls

because in our processes of manufacture an unequalled uniformity and accuracy is obtained by the use of automatic machinery by skilled operators

because we maintain an elaborate system of minute inspection after every operation on each part in the manufacture of Gurney Ball Bearings, and

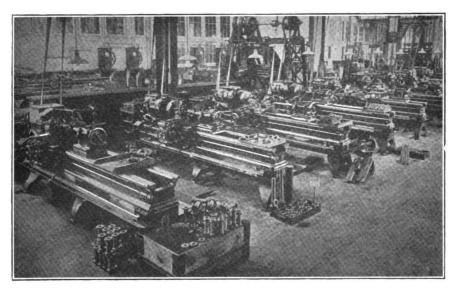
because our Engineering Service Department is always ready to promptly render expert advice regarding proper sizes and types of bearings to use, that we can guarantee to give satisfactory service, and to design suitable mountings, oil and dirt seals, etc.

GURNEY BALL BEARING COMPANY

Conrad Patent Licensee

JAMESTOWN, N. Y.

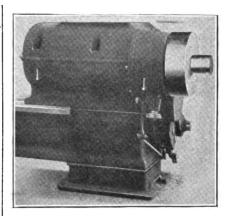
Ball Bearings with Exceptionally Large Load Capacities Bearings of Annular Type for Combined Radial and Thrust Loads



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Production is the slogan of the present day. Machine Tools are wanted which can be speeded up more and more, and which can take still heavier cuts. Yet they are expected to stand up and last under increased strains, and to produce work of uniform accuracy.

The problems of carrying both radial and thrust loads, separately or in combination, as well as other complicated bearing questions, are successfully answered by Gurney Engineering experience. Gurney Ball Bearings are made in different types and sizes to meet various radial and thrust load requirements, and the Gurney Organization is prepared to render intelligent, efficient and cooperative Engineering Service in recommending some standard bearing that will exactly fit your requirements.



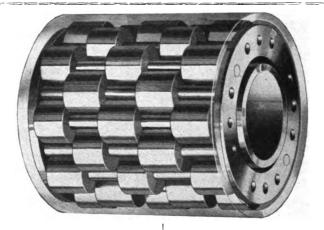
Insure correct installation of the right kind of bearings in your machines by referring your problems to our Engineering Department.

At your service.

THE HART ROLLER BEARING CO.

ORANGE, N. J.

Manufacturers of Roller Bearings for Use on Automobiles, Motor Trucks, Farm Tractors, Marine Bearings, Shafts, Textile Machinery, Concrete Machinery, Mine Cars, Ore Cars, Steel Mill Cars, Trailers, Hand Trucks and Machine Tools



370 HART STAGGERED ROLLER BEARINGS:

IN THE construction of the HART ROLLER BEARING staggered rollers are substituted for those of the straight type, this arrangement permitting the use of rollers of two different widths arranged with staggered ends in assembly and meshed, thereby covering the entire surface of the shaft and outer casing. The rollers are mounted on alignment shafts supported at their ends by retainer rings, in which they revolve freely.

The staggered arrangement of the rolls effects a substantial reduction of the bearing angle and relieves the bearing of a large part of the strain to which it would otherwise be subjected.

The arrangement also provides spaces for a freer circulation of oil or grease lubricant.

In the HART ROLLER BEARING the row of rollers which is light loaded is free to rotate independently of the heavy loaded row of rollers; that is, a differential movement occurs between individual sections of a given roller, with the result that objectionable features resulting from eccentric loading of the bearing are overcome.

The HART ROLLERS are made from a special analysis alloy steel which is carefully heat-treated. The bearing parts are all precision machined and accurately ground.

THE PRINCIPLE on which HART ROLLER BEARINGS are constructed is a distinct departure from the methods now extant. The distinctive feature of the HART ROLLER BEARING is the staggered and meshed roller arrangement which gives this bearing a far greater load capacity than that of any other bearing. The rollers are so arranged that they will not form a track in either the sleeve or casing.

HART ROLLER BEARINGS are designed for light or heavy duty purposes where efficient radial bearings are desired.

We offer the coöperation of our Engineering Department to users and prospective users of HART ROLLER BEARINGS in suggesting the size and type of bearing best adapted for any particular work. To secure this coöperation, it will be necessary to furnish us blue prints, maximum and minimum loads and speeds of your problems. Such information will be held in the strictest confidence.

Write for our engineering data.

THE NORMA COMPANY OF AMERICA

ANABLE AVE., LONG ISLAND CITY, NEW YORK, N. Y.

Telephone, Hunter Point 1616

"Norma" Ball, Roller, Thrust and Combination Bearings

"NORMA" BALL BEARINGS:



Open type, separable bearings of extremely high precision, rigidly mounted, silent running, with every element in workmanship and design contributing to high efficiency, long-time service; notably successful in high-speed operation, being the standard bearings with most of the leading manufacturers of high-speed electrical apparatus.

"NORMA" ROLLER BEARINGS:

Heavy
duty, highefficiency
bearings preeminently
adapted for
service where
shock, jar.
vibration and
sudden load
variations
must be
encountered;
double the



load capacity of a ball bearing of the same dimensions; temporary overload capacity up to 50 per cent of their own rating; high-speed, quiet-running units of extreme precision and maximum durability.

"NORMA" THRUST BEARINGS:



Precision units affording maximum anti-friction efficiency under end-thrust loads; designed to afford long-service durability and silent-running qualities: made in several styles, single and double, both without housings and with housings of several types giving self-contained advantages.

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"NORMA" COMBINATION BEARINGS:



Self-contained units affording perfect adjustment and maximum anti-friction efficiency under combined radial and thrust load; two types—combined annular and ball thrust, and combined roller and ball thrust, distinguished by high precision, open-type construction, rigid mounting, silent-running and high-speed

qualities.

OURANTS IN MECHANICAL ENGINEERING THE STATE OF THE STATE

Send for the complete catalog, "Norma Precision Bearings."

HYATT ROLLER BEARING CO.

NEW YORK, N. Y.

Manufacturers of Bearings for Mine Cars, Countershafts, Industrial Cars, Trucks of all kinds, Cranes, Trolleys and Hoists, Steel Mill Equipment, Concrete Mixers, Textile Machinery, Conveyors, Machine Tools and Line Shafting

The rapidly growing use of anti-friction bearings in all classes of machinery to conserve power, to cut down lubrication and attention costs and to insure dependability of operation, is a matter of especial interest to every engineer.

Eventually anti-friction bearings will entirely displace plain friction bearings as succeeding years increase the demand for more economical, more dependable operation of machinery. The gigantic wastes that have existed in our country due to its abundance of fuels and materials are being slowly but surely checked and anti-friction bearings are one of the soundest means of eliminating these wastes.

provide an anti-friction unit that is simple to apply and that is dependable and effective.

Hyatt Roller Bearings have been used

rectly designed, substantial cage, they

for years with unvarying success in steel mill cars and roller tables, machine tools of all kinds, mine cars, conveyors, industrial trucks, textile machinery, railway service cars, cranes, trolleys and hoists, automobiles, tractors, etc.

You will find our Engineering Bulletins of interest and value to you. They contain complete designs for the application of Hyatt Roller Bearings to all classes of machines. We shall be glad to send you Bulletins covering the applications in which you are interested.



HYATT ROLLER BEARINGS:

Are anti-friction bearings that merit the careful consideration of every thinking engineer, because they are designed and constructed according to sound engineering principles.

By reason of the slight flexibility of the roller, Hyatt Bearings carry the load on an area. This materially reduces the unit load and enables the surfaces of the shaft and the bearing to stand up under shock loads without permanent deformation.

The chrome-vanadium steel rollers are heat-treated to a hardness that successfully resists wear. Assembled in a cor-



HYATT LINE SHAFT BOX:

Hyatt Roller Bearing Line Shaft Boxes can be applied to any of these types of hanger frames:

- 1. 4 Point Set Screw Frame.
- 2. Pioneer Steel Frame.
- 3. Universal Giant (U. G.) Frame.
- 4. Ball and Socket (B. & S.) Frame.
- 5. J-Type Frame.

The Hyatt Box is split in two sections throughout. No elaborate change-overs are necessary to install the Boxes. Simply take out the old babbitted box and put in the Hyatt Box.

HYATT ROLLER BEARING CO.

HYATT ROLLER BEARING HANGERS:

The widespread need for increased efficiency in production has caused more attention to be paid to the power savings made possible by reducing the friction of moving parts of machinery. The perfection of antifriction bearings has eliminated a large percentage of the power waste caused by ordinary friction bearings.



Hyatt Line Shaft Box Mounted in a Standard 4-Point Set Screw Hanger

The true rolling motion of the HYATT ROLLER BEARING HANGERS eliminates at least 50% of the friction that exists in plain babbitted bearings, making possible a reduction of 15% of the total power. By the use of HYATT ROLLER BEARING HANGERS, therefore, you can either increase your present equipment without enlarging your power plant or you can effect a 15% reduction in your power bill—a saving of special importance at this time.

HYATT ROLLER BEARING HANGERS are made for all standard sizes of shafting and being split can be slipped into position without removing pulleys, couplings or frames. The boxes are filled with oil after which they need not be lubricated for another four months.



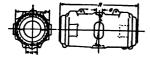
Hyatt Line Shaft Box Mounted on U-G Hanger

The bearing itself consists of a series of flexible rollers of chrome vanadium steel, retained in position by a substantial steel cage. Being hollow and having helical openings throughout their length, the rollers continually cover all bearing surfaces with oil.

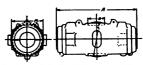
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HYATT ROLLER BEARING HANGERS are sturdily and accurately constructed and give satisfactory service year in and year out. There are many of them still in operation after 25 to 30 years of practical service—carning dividends through savings in power, oil and labor.

Install HYATT ROLLER BEARINGS in your present hangers and on all new Equipment. Save power, oil and attention. Our Line Shaft Bulletin containing prices and sizes of boxes and hangers and engineering data will be of real value to you.



DIMENSIONS , OF HYATT STANDARD BOXES



Either U. G. or B. & S. boxes may be used in four set screw hangers

Diam. of Shaft,	Approx.	A		В		F		G		H
Inches	Weight, Lbs.	BS	UG	BS	UG	BS	UG	BS	UG	UG
$\begin{array}{c} 1_{\frac{7}{16}} \\ 1_{\frac{16}{16}} \\ 1_{\frac{16}{16}} \\ 2_{\frac{3}{16}} \\ 2_{\frac{16}{16}} \\ 2_{\frac{16}{16}} \\ 2_{\frac{16}{16}} \\ 3_{\frac{7}{16}} \\ 3_{\frac{7}{16}} \\ 3_{\frac{7}{16}} \end{array}$	11 14 22 27 38 46 60 67 110	814 914 1012 1112 13 14 1514 1612 1714	8 1/4 9 1/4 10 1/2 11 1/2 13 14 15 1/4 16 1/2 17 1/4	33/4 37/8 41/2 47/8 55/8 57/8 61/2 71/4	35/8 38/4 41/2 47/8 51/2 56/3/8 63/8 71/8	334 378 478 478 578 578 6112 714	37/8 4 47/8 5 53/4 6 61/2 63/4 73/4	115 115 21,2 21,2 3 3 1,2 3 3,4 3 3,4	114 114 134 134 134 134 214 214 214	$\begin{array}{c} 1\frac{11}{16} \\ 1\frac{11}{16} \\ 2\frac{3}{16} \\ 2\frac{3}{16} \\ 2\frac{3}{16} \\ 2\frac{1}{16} \\ 2\frac{11}{16} \\ 2\frac{11}{16} \\ 2\frac{1}{16} \end{array}$
3 16 3 16 4 76 4 15 4 15	182 230 280 330	19½ 20 22¼ 24½	20 22¼	8 1/4 8 3/4 9 1/2 10	8½ 8½ 85/8	$10\frac{1}{2}$ $10\frac{1}{2}$ $10\frac{1}{2}$ $10\frac{1}{2}$	95%	45/8 45/8 51/2 63%	27/8 23/4	3 3
5 16 5 18	380 500	24¾ 30		10¾ 12		12 125/8		67/8		1::

THE NEW DEPARTURE MFG. CO.

MAIN OFFICE AND WORKS, BRISTOL, CONN.

Plants at Bristol, HARTFORD AND MERIDEN, CONN.

Detroit Branch 818 Ford Bldg.

Conrad Patent Licensee

Chicago Branch 2721 So. Michigan Ave.



NEW DEPARTURE BALL BEARINGS:

New Departure ball bearings are manufactured in a New England factory where high standards of quality have been maintained for a quarter of a century and have given the manufacturers a 374 favorable reputation throughout the world. The sincere aim of this Company has been and is to manufacture a ball bearing approaching as closely to absolute perfection as is humanly possible. In furtherance of this attainment, a highly specialized corps of laboratorial and mechanical engineers is employed, special machinery, exclusive processes and methods have been devised, and an inspection and testing system is in operation that is more exacting in its requirements of quality than found in almost any other industry under the sun.

Ultra-severe endurance tests are kept continually running under conditions far beyond that required of bearings in actual service and by such is the final criteron of ultimate service determined and upheld.

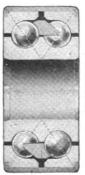
The quality of New Departure bearings is further assured by the use of special chrome alloy steel, subjected to an ultra refined heat treatment, to further refine an already fine structure.

The development of New Departure Plants for the production of ball bearings has, within the last decade, been a most rapid and healthy growth, until, at the present time, it has become the largest ball bearing manufactory in the entire world,

Double Row Type:

Double Row Type:

This bearing is the most successful twopurpose ball bearing available. The design of
the bearing and the angular contact of the two
rows of balls with the raceways render this
bearing equally efficient in carrying radial loads
or resisting thrust stresses from whatever direction they may come, singly or in combination.
The separator is so designed that each row of
balls travels independently within its own
spacing member, pockets of which are filled with
lubricant, each ball rolling friction free in a film
of oil. Except in those few places where only
strictly radial loads and stresses occur, this bearing offers important advantages. It can be
used successfully to replace combinations of
single row and thrust bearings, simplifying designing, machining, assembly, and economizing
installation cost.





Cross Section

Cut Open View

Another distinctive advantage is that it offers anounce distinctive advantage is that it offers permanently correct, non-adjustable assembly and avoids danger of misalignment of separate members which is apt to occur when two or more separate bearings are used to do the same work. This bearing is made to standard sizes of bore and diameter, but not of widths.

Descriptive and dimensional tables with price upon application.

THE NEW DEPARTURE MFG. CO.

Single Row Type:

A high quality ball bearing combining best materials, workmanship, and precision of dimension with correct design for withstanding radial loads imposed





Cross Section

Cut Open View

without friction. The largest size and number of balls possible for a given bearing are used and the ball spacer is so designed that the balls perform their work with practically no rubbing against the sides of their pockets. This bearing is made to internationally standardized dimensions.

The cup and cone are made of electric furnace high carbon chrome alloy steel, with an accurately generated curvilinear raceway and regularly finished to limits standardized by the Society of Automotive Engineers.

Magneto Type:

A ball bearing that most truly is built



like a watch, small in size, exquisite in the precision of its every part and detail, and so designed as to be specially adaptable to noiseless running at high speeds.

Descriptive and dimensional tables with price list Magneto Type sent upon application.

Radax Type:

This bearing is capable of carrying radial loads and taking one-direction thrust stresses. The point of contact of balls and races is at 11 degrees, thus making the radial and thrust capacities practically equal. The cup and cone are separable but the use of a retaining spring in the cup permits the handling or the housing of the bearing as a unit. The separator simulates the perfected single row type which allows maximum number of balls to the bearing. The same standards of quality that are applied to the manufacture, inspection and test of the two bearings named above, obtain in this product also.





Cross Section Radax Type

Cut Open View Radax Type

To assist designers in the selection and proper mounting of New Departure Ball Bearings in any mechanism, our Engineering Department issues an Engineering Catalog in loose-leaf form, containing over a hundred applications to various types of machinery. New sheets are added monthly. This catalog and the supplementary bulletin service are offered to all engineers, designers and builders of machinery who request it on their letterhead.

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ROYERSFORD FOUNDRY AND MACHINE CO.

52 N. 5TH ST., PHILADELPHIA, PA.

Manufacturers of Roller Bearings and Other Power Transmission Machinery

"SELLS" ROLLER BEARINGS:

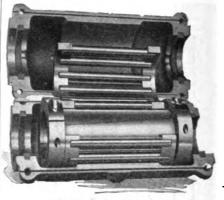
"Sells" Roller Bearings instantly fit all hangers, post hangers and pillow blocks of corresponding size. They are split throughout. Their installation is an overnight job—no interference with production. They are made with single and double roller structure—the latter for heavy bearing duty.

An important feature of "Sells" Roller

376 Bearings is the split steel sleeve that
fits over the shaft and protects it from
the hard rollers. This sleeve is clamped
to the shift by means of split collars
The rollers themselves are carbonized,



The "Sells" Roller Bearing Drop Hanger



Single Roller Structure "Sells" Roller Bearings

hardened and ground outside and have soft resilient centers.

The rollers are retained snugly in the roller structure, and are held always parallel to the shaft. There can be no roller-against-roller friction. All end thrust is absorbed.

Some of the largest concerns in the country have adopted "Sells" Roller Bearings. We have letters from many of these, giving the savings in power effected through the use of "Sells" Roller Bearings. This saving ranges from 10% to 30%. Ten percent saving is always guaranteed. Let us send you a few of these letters.

Let us also send a catalog on antifriction power transmission.

ROYERSFORD FOUNDRY AND MACHINE CO.





"Sells" Oil-and-Grease Gun

ROLLERINE:

Compounded expressly for the lubrication of "Sells" Roller Bearings and other roller and ball

bearings. "Rollerine" contains no wax, talc, soapstone, resin, resin oil or any other gum of high frictional properties. When used to lubricate "Sells" Bearings, "Rollerine" gives maximum efficiency.

Write for free sample.

"SELLS" ROLLER BEARING BOXES with Single Roller Structure for Line Shafts

Size of shaft, inches	Price	Length of box, inches	Width of box, inches	Height of box, inches
*Ibex 1 & 1	\$6.00	63%	2 11	23/4
Ice 1音&1¼ Idea	7.00	611	3	3♣
1 Ar & 1½ I diot	8.00	7 👫	3 👬	35%
1 14 & 1% Idol	9.50	8	3¾	4 👬
1 14 & 2 Ignite	11.00	83/8	3 1	41/4
2 1 & 2 1/4 Ilk	13.50	93/4	41/2	51/8
2 1 & 2 1/2 Image	15.50	101/4	434	53%
2 1 & 2 1/4 Imbibe	19.00	105/8	53/8	614
2 H & 3 Immerse	22.50	11	51/2	61/4
3 A & 3 1/4 Impose	34.50	117/8	6	61/8
3 社 & 3 ½ Imposter	38.50	123/8	6	6]
3 H & 3 1/4 Improve	67.00	14 1	6 H	73/8
314 & 4 Inapt	77.00	15	71/2	716
4 1 & 4 1/4 Inca	. 88.00	15 🙀	71/8	85/8
4 1 & 4 ½ Incense	100.00	161/8	8	838
1 H & 4% Income	113.00	161/2	8!2	918
414 & 5	128.00	17	8#	938

THE "SELLS" OIL-AND-GREASE GUN: affords the most efficient means for apply-

ing "Rollerine" to "Sells" Roller Bearings. It is also adapted for heavy oils and greases of all kinds.

The hand wheel operating a pinion meshing in the rack makes it easy to control the amount of lubricant forced out. Its economy is very apparent. A curved nozzle adds to the convenience in applying the lubricant.

HEAVY DUTY "SELLS" ROLLER BEARING BOXES with Double Roller Structures for Main or Jack Shafts and Heavy Belt Pulls 377

Size of shaft, inches	Price	Length of box, inches	Width of box, inches	Height of box, inches
*Impound 1 # & 2	\$19.00	13	3 11	45%
Imprint 2 1 & 2 1/4 Inarch	23.50	13¾	41/2	5 產
2 14 & 2 1/2 Inborn	26.50	143%	43/4	5 1
2 H & 234 Inbred	32.50	1514	51/4	61%
211 & 3 Inclose 3 & & 31/4	39.00 59.00	173/8 17	514	6 ∱ 6¾
Incog	66.00	17%	5 14 6	634
Indeed 3 1/4	94.00	1914	611	7 Hz
Indent 3 H & 4 Index	110.00	1934	71/8	8
4 & 4 ¼ Indigo	126.00	21	71/8	85%
4 1 & 4 ½ Induce	140.00	2134	8	9
4 14 & 4 1/4 Infant 4 14 & 5	161.00 179.00	223% 24	8½ 8H	878 946
Increase	230.00	2434	91/2	101/2
Incrout 514 & 6	316.00	2614	103/8	1112

*These words are code words and refer to box taking size of shaft above which they are placed.

S K F INDUSTRIES,

INCORPORATED

165 Broadway, NEW YORK CITY

BOSTON
PHILADELPHIA
ATLANTA

BUFFALO CLEVELAND DETROIT CINCINNATI CHICAGO SAN FRANCISCO

Manufacturers of Deep Groove Ball Bearings; Self-Aligning Radial, Adapter, and Thrust Ball Bearings and Shaft Hangers; Pillow Blocks; and Steel Balls

BEARING SERVICE:

The S K F Industries, Inc., recognizing the value of scientific research as applied to the solution of problems affecting the manufacture and application of ball bearings have established a laboratory for the purpose of investigating all matters relating to friction and its treatment.

S K F Industries have developed the use of ball bearings in many industries which has been the means of increasing the efficiency of the machinery and improving the methods of manufacture. The extensive and varied use of ball bearings has made it desirable that their application should be dealt with in a more scientific manner than formerly in order to obtain the best results and also develop the field of application.

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The Bearing Service was established by S K F Industries for the following purposes.

- To make a scientific study of friction through the employment of the most modern testing apparatus and other facilities at the Laboratory.
- To investigate or develop any device or apparatus that will tend to eliminate friction.
- To improve the quality of materials of which ball bearings are made and also to improve methods of manufacture.
- To assist customers in the selection of suitable bearings for individual applications and to make recommendations in regard to correct mounting and lubrication, etc.

In this service the customer benefits from the experience gained by the S K F Industries during many years spent in development of the product. This service also secures for the customer more reliable and lasting service from his machinery equipped with ball bearings. The service secures for the bearing itself more consideration in regard to its load capacity and purpose for which it is to be employed. It is a service that contemplates more than the sale of a bearing.

The S K F Industries make a high class product. Back of the product is a technical organization which ensures engineering co-operation of a practical char-

acter. The product comprises the Hess-Bright deep groove radial bearing, the S K F self-aligning radial and thrust bearings, and the Atlas chrome alloy steel balls.

American manufacturers are invited to avail themselves of this bearing service at any time.

HESS-BRIGHT BALL BEARINGS:

H-B Radial Bearings are made under the Conrad patent and are characterized by an uninterrupted deep groove type of construction. This design gives them exceptional load carrying capacities in heavy service accompanied by shocks and considerable thrust load. The heavy rings of continuous uniform cross-section are susceptible of extreme accuracy in manufacturing and maintained accuracy in service. As the cross-section of the raceway is approximately U-shaped, the raceway possesses great power of resistance against any possible distortion caused by the balls supporting the load.

Deep grooves produce the maximum possible carrying capacity of balls and raceways without the increase of internal friction.

The depth of grooves together with the uninterrupted raceways permit this type of bearing to accept thrust loads amounting to a high percentage of the radial capacity.



Hess-Bright Deep Groove Type Radial Ball Bearing

The design, method of assembly, and quality of material and workmanship

S K F INDUSTRIES,

INCORPORATED

165 Broadway, NEW YORK CITY

Boston PHILADELPHIA ATLANTA CLEVELAND DETROIT

CINCINNATI CHICAGO SAN FRANCISCO

Manufacturers of Deep Groove Ball Bearings; Self-Aligning Radial, Adapter, and Thrust Ball Bearings and Shaft Hangers; Pillow Blocks; and Steel Balls



Thrust Bearing

employed have produced a bearing of the highest quality as proved by the many successful applications.

S K F BALL BEARINGS:

S K F Radial Bearings possess the exclusive feature of self-alignment within the bearing itself so that regardless of whether the shaft is deflected or is out of alignment it turns freely.

Two rows of balls with the radial load always equally distributed on both rows under all conditions of service make it possible to fully utilize the large number of balls employed. The cross-section of the outer raceway is such that the balls are supported at the heaviest section of the ring.

S K F Thrust Bearings are made in a single or double thrust type. Either may be provided with flat seat or aligning seat and washer. They are employed wherever heavy and continuous thrust loads must be supported and can under no circumstances be used to sustain radial loads.

The rolling friction of the SKF type is at a minimum. The friction is less than in any other type of bearing under all speed and load conditions. This is of particular importance in high speed applications.

An exclusive S K F type is the self-contained, self-aligning double thrust bearing. Since the design of this bearing is such that the parts adjust themselves freely to any degree of misalignment occurring under operating conditions, the 379 load is always distributed equally over all the balls.

Mounting is made simple since there is only one part to handle. The accurate and costly machining required is also greatly reduced and in case of disassembly the bearing can be readily reassembled without danger of disturbing the original adjustment of the parts.



S K F Power Transmission Equipment

consists of the self-aligning adapter bearing with hanger for supporting the shafting. The adapter bearing has the same

(Continued on next page)

(Continued from preceding pages)

SKF INDUSTRIES,

INCORPORATED

165 Broadway, NEW YORK CITY

Boston Philadelphia Atlanta BUFFALO CLEVELAND DETROIT CINCINNATI CHICAGO SAN FRANCISCO

Manufacturers of Deep Groove Ball Bearings; Self-Aligning Radial, Adapter, and Thrust Ball Bearings and Shaft Hangers; Pillow Blocks; and Steel Balls



Carton in which Atlas Steel Balls are Packed and Sealed

desirable features as possessed by the S K F radial bearing. To mount it no machining of the shaft is necessary. The bore of the inner race is tapered and fits on a conical split sleeve. This sleeve is simply slipped over the shaft; the bearing is drawn in place on it and a lock nut holds the bearing firmly in position on the shaft. The bearing adapts itself to shaft deflections and misalignment and allows the shaft to turn freely without binding strains or cramping the balls.

ATLAS STEEL BALLS:



TRADE MARK

Atlas Balls are manufactured under the most rigid standards and by the best process of known manufacture. Extreme care is used in selecting the material for the balls. The steel must be of uniform composition, structure and toughness. It must be free from imperfections and be susceptible to highly developed methods of heat treatment.

Skilled workmanship and a high degree of accuracy are maintained at all times. Thorough and careful inspection after every operation in the process of manufacture maintains the specified standards and eliminates all defective material.

The necessity for this care and precision in manufacture is not generally appreciated. The limits of tolerance are much smaller than are generally considered feasible and the finish of the surface of the balls must be of the highest. Grinding or polishing marks that may be detected by the naked eye immediately condemn the ball. The higher the surface finish, the better the endurance of the ball. Apparently flawless ball surfaces show up under the microscope as fine scratches, pittings and even gash-like defects according to the care devoted to the final operations. Surface polish alone will not do as it is but the final touch applied to truly ground shapes.

The balls approach as nearly as possible true spheres. Moreover, the allowable variation from ball to ball in a given size is extremely small. Atlas balls are made as true as it is mechanically possible and commercially practicable to realize.

They are guaranteed to be accurate and true to size both in diameter and sphericity to within the one ten-thousandth part of an inch.



THE TIMKEN ROLLER BEARING CO.

CANTON, OHIO

Plants manufacturing complete bearings at

CANTON, OHIO; COLUMBUS, OHIO; BIRMINGHAM, ENGLAND; PARIS, FRANCE General Offices, Steel, Rolling and Tube Mills, CANTON, OHIO.

Timken Tapered Roller Bearings for Passenger Cars, Trucks, Trailers, Tractors, Farm Implements, Machinery, and Industrial Appliances

TIMKEN TAPERED ROLLER BEARINGS:



Design of Timken bearings is based on the cone, as contrasted with the sphere of ball bearings, and the cylinder of straight roller bearings. The bearing consists primarily of three working parts, an inner race, or "cone," an outer race, or "cup," and conical or tapered "rolls" which operate between the two races. The apexes of the conical surfaces of cone, cup and rolls coincide on the axis of the bearing, so that true rolling action is obtained. These parts, made of elec-tric-furnace steel, hardened and ground accurately to size, and a one-piece pressed steel "cage" or retainer which spaces and aligns the rolls, complete the bearing.

Superior Features of Timken Bearings Are:

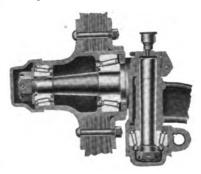
- Ability to carry either thrust or radial load, or both in combination.
- 2. Perfect adjustability for wear. Looseness due to wear is readily taken up by advancing the inner race further into the outer race or cup, or vice versa. In practice provision is always made for making this adjustment in a simple and easy manner, by tightening a nut, or threaded carrier, or by removal of shims,
- 3. Simplicity of mounting. Inner and outer races can be mounted in nearly

all cases without the use of clamping nuts or auxiliary devices to hold them in position. Either or both parts can be press-fitted with a heavy draft without danger of binding or cramping the bearing. These three advantages are all due to the conical construction of the bearing.

4. Quality of material. The Timken Roller Bearing Company manufactures and fabricates its own steel for cups, cones and rolls, and is, therefore, able to dictate exactly and obtain the proper qualities in the raw material to give the best results in the finished product.

Due to its careful design and manufacture, the Timken bearing is pre-eminently a "hard service" bearing, and is used throughout automotive vehicles 381 at the points of severest service, in front and rear wheels of passenger cars, trucks and tractors, and on differentials, pinion and worm shafts, and in transmissions of the same vehicles.

The use of Timken Bearings is by no means limited to the automotive industries. They are recommended for use wherever service is hard, adjustment is necessary and load is a combination of radial and thrust loads. The tapered roller bearing—the Timken type—is the type of bearing that will function properly under radial load, or thrust load, and all possible combinations of the two.



Front Wheel and Spindle Mounted on Timken Roller Bearings

STANDARD STEEL AND BEARINGS

INCORPORATED

Philadelphia Standard Roller Bearing Co. Plainville, Conn.

Pittsburgh Braeburn Steel Co.

EXECUTIVE OFFICES: 3

366 MADISON AVENUE, NEW YORK CITY

Controlled and Operated by

MARLIN-ROCKWELL CORPORATION

Manufacturers of S. R. B. Maximum Silent Type Annular Ball Bearings (Single Row and Double Row), S. R. B. Improved Type Taper Roller Bearings, "Standard Chrome Alloy" Steel Balls, Rudge-Whitworth Detachable Wire Wheels

S. R. B. ANNULAR BALL BEARINGS:

It is a fact and has been proven by conclusive tests for strength and endurance that S. R. B. Bearings are superior to any bearings made in America.



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There are three fundamental principles upon which we base this claim of superiority, namely:

1st. Accuracy

of chemical composition of the steel used in their manufacture.

2nd. Accuracy of heat treatment which produces the correct physical structure in the steel.

3rd. Accuracy of mechanical execution in the grinding and fitting of all the component parts.

We stand ready to prove these assertions.

S. R. B. Maximum Silent Type Annular Ball Bearings are so called because no other name is so appropriately descriptive; maximum, because they contain the greatest number of balls possible to put into a bearing of this type; silent, because they are positively noiseless.

They are capable of sustaining greater thrust loads than other annular ball

bearings because of four specific points of merit in their design and workmanship:

1st. Deep ball groove in races.

2nd. Large diameter balls.

3rd. Maximum number of balls.

4th. Accurate and compact fitting assembly.

S. R. B. Bearings are interchangeable with all other makes of annular ball bearings, either domestic or foreign; comparative table showing the most commonly used sizes will be sent upon request.

It has been frequently demonstrated that under some conditions one type of bearing works a tremendous saving over another. Certain other conditions some-

times develop which make one type of bearing impracticable for the use intended. Under certain load conditions, a



smaller bearing can be used very often with the same satisfaction and service as the larger one. Sometimes by making a slight change in application, according to the bearing maker's point of view, greater efficiency can be obtained.

STANDARD STEEL AND BEARINGS

INCORPORATED

You will find us always ready to solve such problems without bias and without charge, and we particularly urge the importance of consulting our Engineering Department in selecting bearings for any mounting. You will find our engineers qualified by training and experience to give expert advice on such problem and by submitting your plans to us, sending if possible blueprints or sketches showing the application and giving complete information regarding speed, load and shaft size, you can be assured that most satisfactory results will be obtained.

S. R. B. Bearings are made to do their work with masterful efficiency.

S. R. B. Improved Type Taper Roller Bearing:



We have designed, tested and are now manufacturing Taper Roller Bearings in accordance with an improved scheme of construc-

tion representing a radical departure as regards shape of rollers and cone from the design of any bearing which has so far appeared on the market. This improved bearing possesses these advantages:

- 1. The parts are simpler to manufacture so that they can be gauged very accurately and all the component parts of the bearing are more nearly interchangeable than it has before been considered possible to make.
- 2. When constructed of the same quality of steel as the same size bearing of a competitor's manufacture, the new design will display four times the endurance and life which the other designs can yield. But when constructed of our superior analysis and correctly heat-

treated steels, the load-sustaining capacity of our new design bearing is still further improved.

- 3. This improved bearing while under load requires the application of one-quarter or one-fifth the torque to set the bearing spinning. This is also an indication of the relative frictional resistance of the new and old type bearings.
- 4. The primary elements of this improved type bearing are of such liberal design and the rollers and cone being contained as one unit, thus attaining simplicity of adjustment, that it commends itself to all who desire to avoid common bearing troubles, resulting in putting a bearing out of commission long before wear or abuse would have brought total incapacity.

"STANDARD CHROME ALLOY" STEEL BALLS:

The increasing use of steel balls for anti-friction bearings has created a demand for balls of the greatest crushing strength combined with durability and great accuracy. After exhaustive investigations on the subject of alloy steels and the effects of various heat treatments on such steels, we are offering our Standard Chrome Alloy Steel Balls, which by actual tests have been shown to have a crushing strength approximately 331/3% greater than that of the best foreign balls of equal size. Standard Chrome Alloy Balls are made from a special chrome alloy steel, made exclusively for us and particularly adapted for the service to which these balls are subjected. The greatest care is exercised in the various processes of manufacture, including the heat treatment and inspection. Standard Chrome Alloy Balls are gauged three times as to their accuracy in diameter and sphericity before shipment, and are guaranteed to have a commercial accuracy of within .0001". Their surfaces are absolutely free from any tool marks or flaws in material.

TRANSMISSION BALL BEARING COMPANY, INC.

BUFFALO, N. Y.

BRANCH HOUSES

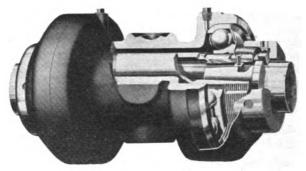
NEW YORK CITY

CHICAGO

PHILADELPHIA

CAMBRIDGE, MASS.

Manufacturers of the Chapman Ball Bearing for Lineshafting



THE CHAPMAN BALL BEARING:

Is designed essentially for lineshafting and is not an incidental adaptation of 384 the ordinary ball bearing to that purpose.

During the seventeen years devoted to their manufacture, Chapman Ball Bearings have been able to save 15 to 40% of the total power in every instance.

Balls of the best chrome alloy steel accurately ground to .0001 of an inch are used in a double row.

Heavy raceways, correctly constructed of special steel, provide a frictionless roadbed, and afford the greatest possible support for the balls. The load is taken at an angle of about 20° from the vertical, thus permitting a percentage of thrust load in either direction, in addition to its radial load. Particular attention has been given to strength and rigidity. The factor of safety provided is far in excess of the load-carrying capacity of the shaft.

There are no moving parts in contact with the shaft. Split tapered sleeve wedges lock the bearing firmly to the shaft, thereby preventing any scoring or wearing.

They are strictly drip-proof, and are impervious to dust or dirt.

The Chapman is a mechanically correct self-aligning bearing. This is an essential feature; as otherwise any departure from true alignment would lead to excessive wear and friction.

Before shipment every Chapman Ball Bearing is subjected to a severe running test under a load and speed much greater than will be met with in actual service, and is then dissembled and carefully inspected before shipping.

Rigid inspection of all raw materials and of parts in process of manufacture is also carefully enforced. The bearings are amply lubricated so as to give from six to twelve months' service without further attention, after which a slight application of grease once or twice a year will suffice under normal conditions.

They are designed to fit any standard adjustable hanger frame, interchanging with babbitted bearings of same shaft size, thereby greatly simplifying a change-over job.

The unequaled service which Chapman Ball Bearings have delivered for eighteen years proves that their use in the 4000 "Chapmanized" plants is justified.

Catalog No. 3 K giving full details of construction and manner of installation will be sent on request.

U. S. BALL BEARING MFG. CO.

(Conrad Patent Licensee)

PALMER ST. AND KOLMAR AVE., CHICAGO, ILL.

Manufacturers of Strom Bearings



BALL BEARINGS:

of all types and sizes to operate under any condition of load and speed.



STROM Radial Bearings:

Made in any size for light, medium or heavy duty; with deep groove ball races accurately formed, in which large sized balls, separated by a light and sturdy retainer, roll true with the least friction. They are especially adapted above all others to sustain large radial loads under severe operating conditions. They are capable of resisting end thrust loads equal to 40% of their available radial capacity in either direction.

STROM Angular Contact Bearings:

Made in the same sizes and interchangeable with the radial bearings. They are of similar construction to the radial bearings, being especially designed to support combinations of radial and heavy end thrust loads acting in one direction. They have an end thrust capacity equal to 150% of their available radial capacity.

STROM Thrust Bearings:

Made in all types and sizes with flat and grooved races to meet all conditions of speed and thrust loads acting in one or two directions, and compensating for misalignment. They are of the same typical sturdy construction for which STROM bearings are noted and are especially adapted to sustain exceptionally large thrust loads.

Engineering Service:

Our Engineering Department comprises a staff of ball bearing experts, and is always at your service. It is our desire that if at any time they may be of service to you, and help you to solve your bearing problems, you will feel at liberty to call upon them.

Any of the following publications gladly furnished on request:

STROM BEARINGS catalogue.
STROM BEARINGS S. A. E. Data
Sheets.

Lubrication of Ball Bearings pamphlet. Limits and Allowances on Shafts and Housings.

Calculating Bearing Loads.

Bulletins on Special Applications.

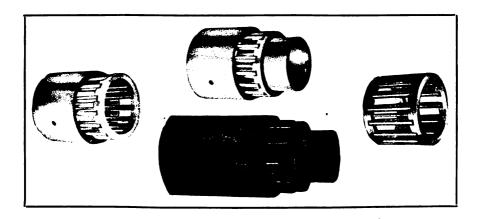
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THE GWILLIAM COMPANY

New York 253 West 58th St. PHILADELPHIA 1314 Arch St. BROOKLYN, N. Y. 23 Flatbush Ave.

Ball and Roller Bearings



JOURNAL ROLLER BEARINGS:

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Heavy Duty Light Duty

Furnished in standard sizes or to your own specifications, with or without casings and sleeves.

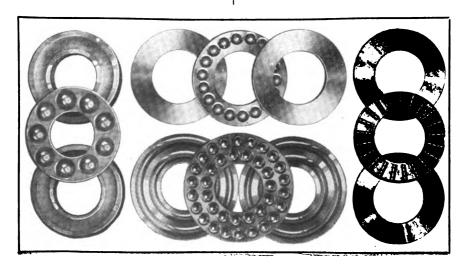
One Bearing or One Thousand

THRUST BEARINGS:

Ball and Roller

Standard Dimensions or to order Inch or Metric Sizes

Write for Bulletin giving details



THE GWILLIAM COMPANY

New York 253 West 58th St. PHILADELPHIA 1314 Arch St. BROOKLYN
23 Flatbush Ave.

Sole Licensed Manufacturers for the U. S. of The Bowden Patent Wire Mechanism



BOWDENOID is of the same construction but is in addition covered with a weatherproof material and is superior for exposed installations.

Furnished in assembled units or separate members in coils.

SPECIFICATIONS

(OUTER	MEMB	ER	INNER MEMBER
(Ord Nu	Order by Number)		oximate ensions owden- olo	Order by Size
11 12 13 14 15 16 51	31 32 33 34 35 36 71 300 301 302 303 303 304	.095 .123 .141 .171 .193 .225 .066 .087 .186 .250 .250 .234	.165 .193 .2253 .288 .320 .136 .182 .250 .332 .316	1/16 5/64 1/8 or 7/64 9/64 11/64 3/16 1/27 or 1/32

BOWDEN WIRE MECHANISM:

Consists mainly of two parts, a closely coiled and practically incompressible spiral wire forming a FLEXIBLE TUBE termed the OUTER MEMBER and a practically inextensible wire cable threaded through the above and termed the INNER MEMBER.

What It Does: The Bowden Wire Mechanism dispenses with complicated angle rods, levers, etc., while enabling a BACK and FORTH motion to be transmitted regardless of curves or direction. It is complete when the inner member is anchored to the operating lever at one end and to the object to be moved at the other.



There are two styles of finish: BOWDENSOLO, in which the outer member is tinned. ADAPTED TO:

Aircraft controls

Motorcycle controls

Motor boat controls

Locking devices

Brakes

Magneto controls

Carburetor controls

Many mechanical devices requiring remote control.



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THE S. S. WHITE DENTAL MFG. CO.

7 Union Square West, NEW YORK CITY

Flexible Shafting

S. S. WHITE FLEXIBLE SHAFTS

Successful application of the flexible shaft drive in portable and stationary apparatus has been the reward of careful study and experimentation.

and the state of t

.com.m.m.

With proper regard for the mechanics of its application and with appropriately designed and correctly made shafting and casing, the flexible shaft drive offers an economical and happy solution of many a difficult problem and is making possible the development of apparatus hitherto unthought of because of unsurmountable obstacles in power transmission.

Complicated and uneconomical methods of transmitting power, involving the use of gears, sectional shafting, universal joints, or a multiplicity of belts, and angle drives, are being re-

placed by the silent, steady, simple device -the flexible shaft.

Speedometer Drive:

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A typical use of the flexible wire wound shaft is in speedometer driving, in which millions of feet of S. S. White shaft are proving its unequalled efficiency and economy in a very large field of application. Similarly for airplane tachometers, recording apparatus, valve control, the engine governor, for high speed or low speed requirements the flexible shaft has unique advantages.

Adaptability of Shafts and Casings:

Wire shafts are constructed to suit their applications in a wide range of diameters and of appropriate grades of

steel. Casings are of fabric or metal as the use demands and fittings in great variety are regularly supplied or made to specifications.

Tool and Machine Applications:

For driving hand-guided tools, in die cutting, drilling, polishing, grinding, and for such devices as hair clippers and massage apparatus where flexibility, light weight and steady transmission of power are all vital to the complete success of the operation, S. S. White Flexible Shafts have an established preference.

S. White Die-Sinker Equipment:

We manufacture complete equipments including large and small handpieces, flexible shaft and casing combina-tions, couplings for motor attachment and bench stands for counter-

shaft drive. Inquiry is invited for these standardized equipments and for any of the parts or units for use with portable grinding and drilling outfits of other design or manufacture.

Developmental Service:

The experience of our engineering department is at the service of manufacturers and designers contemplating the use of the Flexible Shaft for any purpose. Many of the most successful applications of the flexible shaft have been the direct results of collaboration between the purchasers and our engineers.

FLEXIBLE SHAFT DEPARTMENT.

DETROIT OAK BELTING CO.

DETROIT, MICH.

ATLANTA, GA. 1518 Hurt Bldg. Agents throughout United States CLEVELAND, O. 27 Noble Court

Manufacturers of Leather Belting

FIRST QUALITY—OAK TANNED—REGULAR CEMENT:

Center portion only of high grade belting butts tanned to our own specifications.



specifications.
Made for
general heavy
service.

Single 16 to 18 oz. Double 29 to 33 oz. Extra heavy double 34 to 36 oz. 3 ply 46 to 48 oz.

Double thickness 3% to $\frac{7}{16}$ ". 3 ply $\frac{9}{16}$ " to 5%".

Medium weight. Recommended for general high speed service where heavy



belt is not required. Single 14 to $15\frac{1}{2}$ oz. Double 26 to

28 oz. 3 ply 42 to 45 oz. Double thickness $\frac{5}{16}$ " to $\frac{11}{32}$ ". 3 ply about $\frac{1}{2}$ " thick.

Light weight. Recommended for small pulleys.



Reg. U. S. Pat. Office

Single 12 to 13½ oz. Double 22 to 25 oz.

Double thickness $\frac{1}{4}$ " to $\frac{9}{32}$ ".

Used principally in double not over 12" wide.

SECOND QUALITY—OAK TANNED— REGULAR CEMENT:

SHORT LAP, moderate price belting made of selected side stock carefully stretched and curried.







Medium

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Light



"NAIAD"—FIRST QUALITY—WATER PROOF:

GUARANTEED



Reg. U. S. Pat. Office ALL WEIGHTS AND SIZES



THE B. F. GOODRICH RUBBER CO.

AKRON, OHIO

Offices in All Principal Cities

Manufacturers of Mechanical Rubber Goods, Tires, Etc.

TRANSMISSION BELTING:

Goodrich belting is famous for its weave of duck, minimum of stretch in service and careful construction throughout. We recommend the following grades: "COMMANDER" Friction surface, gum cushion under first ply, extra quality for extreme service conditions.

"PILGRIM"—regular rubber covered, heavy duck, good friction and cover, for general service.

"MARATHON." A friction service belt of highest quality. built on special woven, light, flexible duck; for small pulley high speed work.

"ROB ROY" and "SIGNAL" Belts, 390 excellent for light drives such as Agricultural Work.

"OILFIELD STITCHED" for all conditions of service in oil fields.

CONVEYOR BELTING:

For conveying ore, coal, and heavy abrasive materials. We have given much time to the development of a duck of maximum strength and extreme flexibility, a strong friction, and an edge armored against chafing in every foot of conveyor belt we manufacture. We especially recommend:

"LONGLIFE" for severe service, where extreme wear and economy are desired.

"SUPER-LONGLIFE," the conveyor belt having the "brute strength" to stand up under the most destructive kinds of service.

"MAXECON" for ordinary service, medium in price, but reliable and serviceable.

"COSSETTE" Belting, of exceptionally high quality throughout for handling cossettes in beet sugar factories. "WHITECOVER" Canning Belt. Special white sanitary cover for food canning factories.

"GRADER" BELTS. We recommend "MAXECON" with 1/2 or 1/6 top cover.

GRAIN ELEVATOR BELTING:

For this purpose we offer the following: "CARIGRAIN," a quality carrier belt, specially developed for grain conveyor service, after a long, thorough study of the service requirements.

"LEGRAIN"—the companion of "CARIGRAIN" for bucket leg service.

ELEVATOR BELTS:

Must have a duck of extra strength, quality and weight to resist the tensile strain and action of the bucket bolts. We use a special heavy duck and recommend the following belts:

"AKRON" Elevator Belt; designed for hard duty anywhere.

"MOR-ECON," designed for general conditions, and stands up to hard service.

"NEW MINING" Elevator Belt. Special high grade for most severe service, recommended for mine elevators. Furnished with either friction surface or highest grade brown cover.

"SUPER-ELEVATOR," an especially rugged construction for "brute service." Stands up successfully against the most adverse operating conditions.

POLISHING BELTS:

Sometimes called Emery Belts, built on specially strong fabric with high quality tough friction.

Our experts will be glad at any time to co-operate on any kind of Rubber Belting proposition.

(See page 279 for addition al products of this Company)

GOODYEAR TIRE & RUBBER COMPANY

AKRON, OHIO

Manufacturers of Transmission, Conveyor and Elevator Belting, Hose, Packing, Valves and Mechanical Rubber Goods

TRANSMISSION BELTING:

Blue Streak: 36-ounce duck thoroughly impregnated with high-grade friction stock. Recommended for main drives and heavy intermittent loads.

Glide: 28-ounce duck with a friction of very high quality. Extremely flexible, it is particularly well-adapted for high speeds and small pulleys.

Endless Cord Belt: Made of very high-grade cords and designed for use on cone drives on speeders. A belt of exceptional merit.

Axle Lighting Belt: For railroads.

CONVEYOR BELTING:

Goodyear: To be used where abrasive conditions are not severe—handling soft coal, etc.

Cougar: High-grade friction and cover. Recommended for conveying materials where abrasive conditions are severe and where trippers are used.

Blue Streak: High-grade friction and highest-grade cover stock. Cover stands an abnormal amount of abrasion. Notably successful in handling all sharp, gritty material.

Hy-Temp: Heat-resisting friction and cover stock. An ideal belt for quenched coke and material whose temperature does not exceed 200 degrees.

ELEVATOR BELTING:

Blue Streak Ore Elevator: A belt that successfully combats the severest bucket elevator conditions.

HOSE:

Monterey Air Drill: Wrapped ply construction with $\frac{3}{32}$ cover which eliminates the necessity of wire-winding. Has rendered exceptional service in mines and quarries.

Monterey Pneumatic Tool: Nonporous oil-resisting tube and high-grade abrasion-resisting cover. No wire-winding. An efficient, serviceable hose for riveting on shipbuilding, structural steel work, etc.

Monterey Steam: A wrapped ply steam hose of great strength with tube so compounded as to resist intense heat. Requires no wire-winding. Its use insures lasting service, safety and economy.

Acid

Brewer's

Chemical

Corrugated Tender

Dredging Sleeves

Mill (Cotton Rubber Lined)

Lawn

Gasoline

Railroad

Kant-kink Air

Radiator

Rotary

Sand Blast

Spray

Suction

Water

PACKING SHEET:

Goodyearite: An asbestos sheet packing of enormous strength and highest heat-resisting qualities. An ideal gasket material for gas engines. Recommended for all steam pressures above 100 lbs.

Red Wing.

Wyoga C. I.

PACKINGS:

Hydraulic

Piston

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THE GRATON & KNIGHT MFG. CO.

WORCESTER, MASS., U. S. A.

Oak Leather Tanners, Makers of Belts and Other Leather Products

Atlanta Boston Pittsburgh Chicago Cleveland Seattle

Dallas, Texas

Detroit Portland, Ore. Graton & Knight Mfg. Co. of Texas,

Kansas City Minneapolis St. Louis

New Orleans Montreal, Can. London, Eng. New York Philadelphia Cincinnati

Graton & Knight Mfg. Co. of Wisconsin, Milwaukee, Wis.

Graton & Knight Mfg. Co. of California, San Francisco, Cal. Distributors in all Principal Cities

Power transmission requirements are confined to a few classes. There's a G & K Standardized Leather Belt for every class. That is the Standardized Series idea-each belt is made for the work to be done.

FIRST QUALITY BRANDS:



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Heart: For heavy loads and high speeds where an extra heavy first quality belt is necessary.



GraKnight: For use where a medium weight first quality belt is required such as on main and counter drives under ordinary conditions.



GraKnight Dynamo: For use on high speed machines such as motors, dynamos, fans, blowers and other drives where small pulleys are used and loads are not excessive.

SPECIAL BRANDS:



Spartan: A heatproof. steamproof. waterproof, unusually flexible belt, possessing great gripping power. It is especially adapted for hard drives and for use where unfavorable conditions exist.



Neptune: For use where belts are subjected to rain, dampness and other unfavorable conditions. It's waterproof.



Spar Oak: For use on heavy duty drives with tight, loose, flange or step cone pulleys and where the edges of the belt are subjected to the injurious effect of shipper fingers.

We also manufacture Round and Twist Leather Belting; Lace Leather cut and in sides; Washers, Packings and Valve Leathers; Belt Cements and Dressings; Strapping and Leather Specialties.

Write for catalog and booklet on Standardization as applied to belting.

THE ROSSENDALE-REDDAWAY BELTING AND HOSE COMPANY

NEWARK, N. J., U. S. A.

Manufacturers of the



Line of Woven and Canvas Belting, including the original

"CAMEL" HAIR BELTING:



- 1. "Camel Hair" Belting is woven of animal hair and cotton in such a manner that the animal hair is brought to the surface and comes in contact with the atmosphere surrounding the belt.
- 2. 100% more elastic than leather belting; 50% more than fabric belting.
- 3. Has a higher coefficient of friction than either.
- 4. Exceedingly pliable; drives safely, economically and effectively.
- 5. Transmits more power without straining shafts or bearings.
- 6. Perfectly uniform thickness, it runs true.
- 7. Permits use of thinner belts, which means lighter pulleys, and reduction of total load on shaft bearings.
- 8. Runs equally well in damp, dry or wet atmosphere.
- 9. Affected less by heat, oil, acids or fumes.
- 10. Tensile strength greater than best leather belting and almost twice that of best oak, tanned double leather belting.
- 11. Its high elasticity allows it to adjust itself readily and rapidly to varying shocks and strains, making it especially suitable to intermittent drives with heavy loads.

"SEMINOLE" RED CANVAS BELTING:

STITCHED-

SEMINOLE BELTING

Made of "Standard" weight duck, specially impregnated, and painted.

The leader in this class of belts.

"DURBAR" SOLID WOVEN COTTON BELTING:

DURBAR BELTING

Made from highest grade long fibre cotton woven under tension to a solid one-piece fabric.

Uniform in surface, thickness and width.

Impregnated with a special water-proofing compound which resists dampness, oil, acid or alkaline fumes, heat or cold.

High frictional grip, constant pliability, unusual elasticity and long life.

Has no superior in cotton beltings.

"SENEGAL" SPECIALTY **CANVAS** BELTING:

SENEGAI BELTING

The highest grade of impregnated stitched-canvas belt.

Made of full weight 32-ounce duck, with flush stitching and special gum impregnation which retains pliability, pre-serves belt fibres, gives high frictional grip and is little affected by dampness, heat or cold.

Superior to other stitched-canvas or rubber belting under severe service conditions.

"CHEROKEE" RED STITCHED-CANVAS BELTING:

> CHEROKE BELTING

Made of 26-ounce duck, impregnated. The paint used gives high frictional grip.

EDW. R. LADEW CO., INC.

FACTORY, GLEN COVE, N. Y.; MAIN OFFICE, 428 BROADWAY, NEW YORK

BOSTON, MASS. CHARLOTTE, N. C. CHICAGO. ILL. CLEVELAND, O.

NEWARK, N. J. NEW YORK, N. Y. PHILADELPHIA, PA. PITTSBURGH, PA.

Distributors in All Principal Cities of the World Carry Complete Stocks

Manufacturers of Leather Belting, Lace Leather, Cut Lacing, Belt Cement, Belt Preservative, Belt Dressing, Belting Accessories; Hydraulic Leather, Leather Packings, Washers, Disks, Shafting Rings; Automobile, Truck and Motorcycle Belts and Specialties in Leather; Leather Welting; Straps of Every Description

HISTORY AND METHODS:



The House of Ladew, founded in 1835, is the oldest leather belting manufacturer and operates the largest leather belting factory in America. It continues to manufacture Hoyt Belting, under the 394 processes perfected by Hoyt, the master belt maker of America. In every foot of Ladew Leather Belting is incorporated the skill, experience, and service-rendering capacity which have made the name "Ladew" synonymous with "belt service," the world over. Ladew Belting has never been made to meet a price. Its market is, and always has been, among those discriminating belt buyers who consider a price in correct relation to the value offered. Ladew Belting is the choice of those whose judgment and experience convince them that "better belting costs less" in the long run.

LADEW ENGINEERING SERVICE:

The proper application of belting is an engineering problem deserving of skilled counsel and the best experience. More belts are destroyed by abuse than by use—abuse here implying neglect of proper care as well as ill-advised applications. To correct wrong conditions

where known, as well as to guard against them in advance where possible, Ladew Engineering Service is maintained. This consists in the advice and assistance of experienced belting engineers who will study any belting problem and give expert advice on its solution. Ladew Service is offered free to all belt users seeking the highest belting economy—which means the lowest belting cost per horse-power per year of service.

SPECIAL BELTS FOR SPECIAL PURPOSES:

The Ladew line-in addition to the two main brands described on the next page-includes a number of other brands made from sections of the hide not considered suitable for "Flintstone" and "Turtle." These are high-grade belts -though never sold as "first-grade" belts-capable of splendid service where the conditions are clearly understood so that the right belt can be supplied for each particular purpose. In many cases a material saving results by the use of these special belts under the advice of Ladew engineers. The House of Ladew also has unequaled facilities for producing, on short order, belts for special or unusual conditions.

Inquiries are invited on all belting problems and a Belting Data Sheet will be sent on request, indicating the information needed for proper advice.

EDW. R LADEW CO., INC.



HOYT'S "FLINTSTONE" LEATHER BELTING:

Standard:

Introduced in 1835 and steadily improved ever since, "Flintstone" is preeminently the belt for all drives where everything depends upon, and everything is expected from, the power transmission. The care in selection of leather and in methods of manufacture, forbids "Flintstone" selling as a cheap belt. But, hundreds of times over, in the decades past, "Flintstone" has proved itself to be the most economical belt—the belt which gives the greatest number of years of service, at the lowest cost per year. Or, stated otherwise, "Flintstone" will transmit more power over a longer period at the lowest cost per horse-power per year. The Ladew trade-mark on "Flintstone" is a guarantee of maximum belting service at minimum belting cost.



HOYT'S "TURTLE" LEATHER BELTING:

Waterproof:

Introduced in 1860, "Turtle" is the original waterproof belt. It is made from center cuts of the best selected hides, tanned and curried by most approved methods, thoroughly impregnated with a water-resistant, water-repellent material, and built up with a special water-proof cement. Even under most extreme moisture conditions, the laps or plies will not open up. For all drives where the utmost in service is sought, in the presence of water, steam, oil or acid furnes, "Turtle" has a record that proves its unsurpassed qualities. The Ladew trade-mark on each "Turtle" belt is a guarantee of Ladew quality—which has been a belting standard for over 85 years.

395



This big wire nail mill is driven throughout with "Flintstone" Belts. The owners have learned by experience that "Flintstone" is protection against shut-downs due to belting troubles.

These four big "Flintstones" have, at this writing, given more than six and one-half years of continuous service. The best previous record on this drive by other belts was 18 months of service.



NEW YORK RUBBER COMPANY

Incorporated 1851

NEW YORK 34 Reade St. HOUSTON, TEXAS 805 Franklin Ave.

CHICAGO 325 W. RANDOLPH ST.

Manufacturers of Mechanical Rubber Goods



"Dependable" No. 4 Conveying Anthracite Coal

396 "DEPENDABLE" CONVEYOR BELTING:

Made with three grades of cover—for service in connection with materials of greater or lesser abrasive qualities. Constructed to eliminate sheering as far as is physically possible—edges protected against edgewear. "DEPENDABLE" Conveyors may be depended upon to deliver the goods.

Other Brands—"GOLD DREDGE,"
"BLUE BIRD" and "STONORE"—the
latter also offered in three grades of
cover.

TRANSMISSION BELTS:

Triumph: Friction surface. Fancy generator belts, as well belt for permanent installation where for any particular service.

initial outlay is not deciding factor. It is worth the difference.

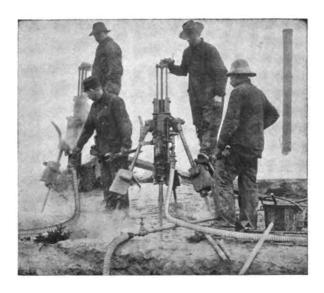
Wiccapee: Friction surface. Recommended for main and important counter drives. It has stood the test of Time. Its installation insures economical transmission.

Our Extra: Friction surface. A good belt for ordinary service. Excellent results obtained in the open, such as on agricultural machinery, etc.

Other Brands: "Tractor," Friction Surface; "Special Elevator;" "Dutchess Stitched;" "Stacker;" "Cameo" and "Clinton" Brands.

We also make hogscraper belts, axle generator belts, as well as special belts for any particular service.

NEW YORK RUBBER COMPANY



"DUTCHESS" AIR DRILL HOSE:

A perfect balance of selected materials and the knowledge of combining them has produced this excellent air drill hose.

"DUTCHESS" STEAM HOSE:

Like "Dutchess" Drill Hose the "DUTCHESS" brand is the only hose we manufacture for this purpose. In service in all industries from coast to coast the natural assumption is it is abused as well as used without complaint. We unreservedly recommend Dutchess.

WATER HOSE:

Again it is "DUTCHESS" which is our first offering. Higher pressures and service conditions more severe than ordinarily encountered are the proper settings for "DUTCHESS" Water Hose.

For ordinary conditions we offer the "CAMEO" Brand.

For out-door fire protection "BLUE BIRD" Rubber Fire Hose is unsurpassed. Flexible and strong, it carries the usual fire hose guarantee as to pressure and service.

We also manufacture dependable hose for pneumatic tool work, Suction, Rotary Drilling, Spraying, Chemical Fire Apparatus, Car and Engine connection, etc., etc.

398

J. E. RHOADS & SONS

MAIN OFFICE: 12 NORTH THIRD STREET, PHILADELPHIA

NEW YORK

Снісадо

WILMINGTON

Manufacturers of Leather Belting, Flat and Round, Leather Belt Preserver, Tanners of Tannate Belting Leather and Tannate Lace Leather

RHOADS OAK BELTING:



The unusual strength and durability of Rhoads Belts save breakdowns and loss from stoppage. Their slight stretch, their trueness, even balance and grip save slippage and take-ups.

LEATHER BELTING PRICE LIST Adopted February 6, 1920 Prices per Running Foot

½ in.	\$.12	51/2 in.	\$1.32	34 in.	\$8.16
5/8 in.	. 15	6 in.	1.44	36 in.	8.64
¾ in.	.18	7 in.	1.68	38 in.	9.12
% in.	.21	8 in.	1.92	40 in.	9.60
l in.	. 24	9 in.	2.16	42 in.	10.08
1 ¼ in.	.30	10 in.	2.40	44 in.	10.56
1 1/2 in.	. 36	12 in.	2.88	46 in.	11.04
1 % in.	.42	14 in.	3.36	48 in.	11.52
2 in.	.48	16 in.	3.84	50 in.	12.00
21/4 in.	. 54	18 in.	4.32	52 in.	12.48
21/2 in.	. 60	20 in.	4.80	54 in.	12.96
234 in.	. 66	22 in.	5.28	56 in	13.44
3 in.	. 72	24 in.	5.76	60 in.	14.40
31/2 in.	. 84	26 in.	6.24	64 in.	15.36
4 in.	.96	28 in.	6.72	68 in.	16.32
4 1/2 in.	1.08	30 in.	7.20	72 in.	17.28
5 in.	1.20	32 in.	7.68	1	

Double Belts List at Twice the Price of Single. Odd widths list at price for next wider size.

TANNATE LEATHER BELTING:



In Tannate Flat Belting you find the above advantages, plus the remarkable toughness given by our Tannate tannage. Tannate takes strong grip on the pulley, reducing elippage to the lowest terms. It has remarkable power of resisting heat.

TANNATE FLAT PRICE LIST Revised February 6, 1920 Net per Running Foot SINGLE BELT

		DINGLE	DELL			
1/2 in.	\$.15	2 1/2 in.	\$.75	8		\$2.40
% in.	. 1834	234 in.	.821/2	9	in.	2.70
% in. 4 in. % in.	. 22 1/9		.90	10	in.	3.00
₹ in.	.2614	3 1/2 in.	1.05	12	in.	3.60
1 in.	.30	4 in.	1.20			
1 1/4 in	. 37 1/2	4 ½ in.	1.35			
112 in.		5 in.	1.50			
134 in.	$.52\frac{1}{2}$	5 1/2 in.	1.65			
2 in.	. 60	6 in.	1.80			
21/4 in.	. 67 1/2	7 in.	2.10			

DOUBLE BELT 1 2 in 5/8 in. 5/4 in. 7/8 in. \$.30 .37½ \$3.00 3.60 4.20 36 in. \$21.60 38 in. 22.80 6 in. 7 in. 8 in. 22.80 24.00 25.20 26.40 27.60 28.80 30.00 $.45^{'}_{-52}$ 40 in. 4.20 4.80 6.00 7.20 8.40 9.60 42 in. 44 in. 46 in. in. .60 .75 .90 10 in. 1 in. 1½ in. 1½ in. 1½ in. 2¼ in. 2¼ in. 2¼ in. 2¼ in. 12 in. 14 in. 16 in. 48 in. 50 in. 1.05 10.80 12.00 14.40 15.60 16.80 1.20 1.35 1.50 18 in. 20 in. 54 in. 56 in. 60 in. 32.40 33.60 24 in. 21/4 in. $\frac{1.65}{1.80}$ 26 in. 28 in. in. 31/2 in. 2.10 30 in. 18.00 19.20 in. 2.40 32 in. 4 1/2 in 2.70 20.40

Odd widths list at price for next wider size.

TANNATE ROUND BELTING:

For twenty odd years Tannate Round Belting has been outlasting ordinary belts from two to five times. Its remarkable grip permits easy drives, and its extreme strength gives unusual durability. It saves you take-ups and repairs. For clothing and shoe factories, it has all competitors beaten. It costs less in the long run.

NET PRICES		Revised	February	2, 1920
In not less than:	1000 ft. lots, per 1000 ft.	500 ft. lots, per 100 ft.	100 ft. lots, per 100 ft.	Per foot
18 18 Reg.	\$41.80 56.00	4.40 5.75	4.80 5.95	7c 8c
keg. ¼ Heavy	75.00	8.00	8.25	10c
1/4	87.00 114.00	9.20 11.50	9.65 12.50	12c 14c
17	144.00 228.00	15.00 24.00	15.85 25.20	18c 29c
16	274.00 320.00	28.00 33.00	29.40 34.35	35c 42c
	392.00	40.20	41.40	49c

The above prices are made only when the quantities specified are ordered for shipment at one time. The quantities may be made up of different sizes.

J. E. RHOADS & SONS

TANNATE LACE LEATHER:



Tannate Lace Leather lasts from three to five times as long as ordinary rawhide. It keeps tough and flexible, and it does not break until it wears out. It saves labor of lacing and the labor costs more than the lace. It increases output and costs less per year.

PRICES ON TANNATE CUT LACE Revised August 1, 1919

	1000 ft. lots, per 100 ft.	500 ft. lots, per 100 ft.	100 ft. lots, per 100 ft.	Less than 100 ft., per ft.
¼ in.	3.95	4.00	4.25	7 c
5 in.	4.70	4.90	5.10	8 c
3/8 in.	5.50	5.65	5.90	8½ c
TR in.	6.20	6.65	6.95	9 c
½ in.	7.20	7.40	7.70	10 c
5/8 in.	8.80	9.35	9.80	12 c
3/4 in.	10.70	11.10	11.70	13 c

TANNATE LACE IN BACKS

Less than ½ dozen, at \$1.70 per sq. ft. ½ dozen and over, at \$1.60 per sq. ft.

The above prices are made only when the quantities specified are ordered for shipment at one time. The quantities may be made up of different sizes. These prices are strictly net.

RHOADS LEATHER BELT PRE-SERVER:

There is an ancient belt that has driven a Pennsylvania flour mill since 1882. This belt owes its green old age to having been treated with Rhoads Preserver for more than 20 years. Rhoads Preserver is highly beneficial to leather. It keeps belts pliable and strong, and gives



them the hug and grip that promote maximum output. It reduces your belt bills

NET PRICES Revised April 3, 1919

LIQUID	
1 gal. (7½ lbs.) \$.28 lb.	
5 gals. (37 ½ lbs.)	
10 gals. (75 lbs.)	
Bbls. or ½ bbls	•
PASTE	
10 lb. cans	399
25 lb. cans	
50 lb. cans	
Bbls. or ½ bbls	
Barrels contain about 400 lbs.	

Prices based strictly on quantity taken in one order and according to size of cans, no matter what the total amount, viz., if 25 10-lb. cans are ordered 10-lb. price is charged.

RHOADS STICK BELT DRESSING:



For belts that slip because of excessive load or other unusual conditions, use Rhoads Stick Belt Dressing. It promotes flexibility and gives a grip that keeps down slippage.

NET PRICES

Revised lipin o,	
One 1-lb. stick	.45 each
1 doz. 1-lb. sticks	.40 each
50 1-lb. sticks	.38 each
One 3-lb. stick	1.15 each
Sample stick	.15 each

SHULTZ BELTING COMPANY

ST. LOUIS, MO., U. S. A.

EXPORT OFFICE: 428-430 BROADWAY, NEW YORK

Manufacturers of Shultz Sable Rawhide Belting, Aqua Waterproof and Steamproof Belting, Oak Tanned Belting, Belt Dressing, Lace Leather, Etc.

SHULTZ SABLE RAWHIDE BELTING:



Shultz Belting is made from the heaviest Packer Steer Hides and the reason why this belting excels all others is because the leather is tanned by our own special process and prepared from the raw material to the finished product under our own personal supervision.

SABLE Rawhide Belting is tanned on the surface—for contact, and the interior is rawhide—for strength. This, combined with its great strength and



This Is Easily Done with Sable Belting of Double Thickness

pliability, enables SABLE to hug the pulleys closer, transmit 25% more power, increase your production and outwear any oak tanned belt.

SHULTZ AQUA BELTING: (Chrome Tan)



Reg. U. S. Pat. Off.

"AQUA" is an absolute Waterproof and Steamproof Leather Belt. It is intended for laundries, dyehouses, bleacheries, damp climates or any place where wet conditions exist.

Now here is where "Aqua" is different from other types of so-called waterproof belts. The waterproofing is tanned right in. It's waterproof on the surfaces and it's waterproof in the middle and remains waterproof under the worst conditions. You can boil a double in live steam and the plies will not separate or the leather lose its strength or pliability.

"Aqua" will outlast any rubber or canvas belt ever made and transmit from 25% to 33% more power.

Test Out:

A SABLE Rawhide or "AQUA" Water-proof Belt on a 60-day "try-it-before-you-buy-it" basis. That is a mighty fair proposition and it gives you an opportunity of letting your eyes be the judge and your money the last thing you part with.

Write for catalogue No. 11.

CLIPPER BELT LACER COMPANY

GRAND RAPIDS, MICH.

Manufacturers of Belt Lacers and Belt Lacing Hooks

"CLIPPER" BELT LACING:



A portable machine and its patented belt hooks that will lace a 6-inch belt in three minutes, providing a smooth, all contact joint with a breaking strength for the steel hooks of 400 lbs. per inch of belt. The joint made is 25% stronger than a leather laced joint, according to experiments made by Fowler.

CONSTRUCTION AND OPERATION:



The "Clipper" Belt Lacer No. 3 is made of crucible steel, malleable iron and tool steel and is practically unbreakable. Production manufacture provides interchangeable parts to replace worn, broken or defective parts.



The "Baby Clipper" Belt Lacer No. 0

When a belt requires lacing, the belt ends are squared up. Then one is inserted in the "Clipper" previously

loaded with belt hooks, and the levers are pressed down forcing the hooks between the fibers and flush with the surface of the belt. The other end is similarly treated and the two ends interlocked with a twisted rawhide or "Fibro" pin, as illustrated. The operation is simple and rapid.

An inexpensive, supplemental lacer, the "Baby Clipper" No. 0, is made for use in a vise as illustrated. A handy belt lacer for the small shop for belts up to 4 inches wide.

"CLIPPER" BELT HOOKS:

These hooks are made of special steel wire of high tensile strength and great fatigue resistance.

Five sizes are made for belts up to and including 3% inch thick and carded for convenience, ready to slip into lacer. They lace belts up to 6 inches wide in one operation. Wider belts in two or three operations.

401



RAWHIDE AND "FIBRO" PINS:

For connecting the "Clipper" laced belt, two classes of pins are furnished:

The twisted rawhide pin is recommended for use where the belt is subjected to twisting, slipping or climbing.

The "Fibro" pin is recommended for straight drives and particularly for use where the belt is subjected to moisture, steam, etc.

SERVICE AND GUARANTEE:

The "Clipper" Belt Lacer is sold with the understanding that, if after thirty days' trial it does not do all that is claimed for it and is not entirely satisfactory, it may be returned without expense.

The "Clipper" Belt Lacer will be kept in repair free of charge by the manufacturers as long as genuine "Clipper" Belt Hooks are used exclusively for lacing belts with it.

Assistance in solving belt lacing problems, catalogues and booklets gladly furnished on request.

FLEXIBLE STEEL LACING CO.

4607 LEXINGTON ST., CHICAGO, ILL.

Manufacturers of Steel Belt Lacing, Electric Lamp Guards

ALLIGATOR •

FLEXIBLE



STEEL BELT LACING:

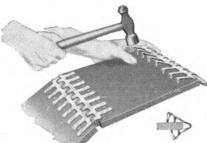
Never Lets Go

Nothing Needed But A Hammer

Alligator belt lacing makes a smoother, stronger joint than any other belt lacing made. It saves time, money and labor. Any workman can repair the average belt in three minutes. No tool needed but a hammer to insure a perfect joint. Compare this saving in help, time and money with any other method.

Alligator Steel Belt Lacing saves the belting. The pull comes against the edge of the teeth and not the flat. Leathe belts are not weakened nor fabric belts injured as this avoids cutting the long threads which carry the strain. Made for all sizes of belting. Alligator Lacing with the patented hinge pin produces the strongest and most enduring flexible joint for any service, including damp or heavy work.

Equip with Alligator. Giving splendid service now on belts the world over in every line of industry.



Great Surplus Strength:

Note the double staggered teeth in the smaller illustration. They give the extra strength to Alligator Steel Lacing. See how the long end teeth pierce the belt and are "clinched" tightly with the hammer. The result is that Alligator Steel Belt Lacing has proved time after time the strongest lacing made. There is no stronger fastener known.

FLEXCO-LOK LAMP GUARD:

Protects your lamps against breakage or theft. Costs less than the lamp itself. Made from expanded steel, plated with noncorroding tin. Halves hinge at bottom, close over lamp and clamp on socket Can be put on in thirty seconds. Strongly re-enforced. Will stand more



abuse than any other guard made. Made in two types—plain (as illustrated) for general use. Also with reflector built in guard. Made in all sizes from 15 Watt Mazda to 200 Watt Nitrogen lamps. Made with key locks or with plain, round head screws.

FLEXCO SPLIT HANDLE PORTABLE:

Handles Split— On in a Moment

A convenient handle for use with Flexco guards. Fits any size except the smallest guard. As easy to put on as the guard. No tampering with sockets or rewiring necessary. Hook for hanging lamp included with handles. Lamp can be carried or hung where desired.



Complete information and prices covering these modern aids to efficiency will be sent on request.



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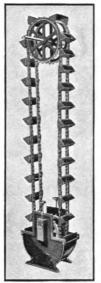
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THE C. O. BARTLETT & SNOW CO.

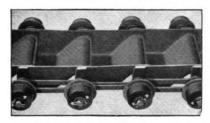
CLEVELAND, OHIO, U. S. A.

Designers and Builders of Dependable Equipment for the Handling and Preparation of Materials. Conveying and Elevating Machinery; Skip Hoists; Dryers; Crushers; Screens; Mixers; Foundry Sand Handling Equipment





Two Standard Types of Bucket Elevators



Common Sense Pan Conveyor for Carrying Hot, Corrosive, or Abrasive Materials



Belt Conveyor Carrying Coal

BARTLETT AND SNOW CONVEYING AND ELEVATING MACHINERY:

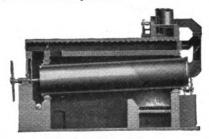
Bartlett and Snow Conveying and Elevating Machinery is built primarily for those conditions which are unusual or exacting.

We enjoy cooperation with engineers in the design of conveying equipments for foundries, power plants, steel mills, chemical works, and industrial plants in general. Coöperation of this sort invariably results in plants which are more profitable, more productive, and more human.

BARTLETT AND SNOW DRYERS:

There are thirteen distinctly different types of Bartlett and Snow Dryers each of which has its particular field of application.

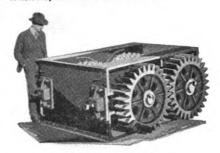
Of these thirteen types, the Style C is unusually well fitted for drying coal in 405 pulverized coal plants.



Style E Double Pass Dryer

AND SNOW COAL BARTLETT CRUSHERS:

Include single roll crushers, two roll crushers, and four roll crushers.



36" x 36" Standard Coal Crusher

H. W. CALDWELL & SON COMPANY

17th St. and Western Ave., CHICAGO, ILL. EASTERN OFFICE: 50 Church St., New York City 709 Main St., Dallas, Texas

Manufacturers of Elevating, Conveying and Power Transmitting Machinery;
Machinery for Handling Material in Bulk or Packages

"HELICOID" CONVEYORS:



Sole manufacturers of "HELICOID" SCREW CONVEYOR made of one continuous strip of metal without laps or rivets. Mounted on standard and extra heavy pipe or solid shafts.

PAN, APRON AND BELT CONVEYORS:



Each designed and built to handle the material for which it is best suited, to the best advantage. For COAL, COKE, SAND, CRUSHED STONE, GRAVEL, GRAIN, BOXES, BARRELS, etc.

CHAINS:

406

Standard Malleable Iron Detachable Chain. Malleable and steel bushed chains with or without rollers. Special chains for Conveying, Elevating or Power Transmitting Purposes.



CHILLED RIM SPROCKETS:

The life of the Chilled Rim sprocket is from Three to Five times that of the ordinary grey iron sprocket. Traction wheels and special sprockets furnished.

BUCKETS:

We carry large stock of standard size and weight Salem. Seamless Steel and Malleable Buckets. We are equipped to make special Buckets of all kinds order.



GEARS:

We can furnish gears with cast Teeth Machine Molded or Machine Cut. We have the most complete equipment in the country for machine molding gears. Spurs, Bevels, Miters, Worms, Worm Wheels and Mortise Wheels.



We are prepared to furnish sheet steel conveyor troughs, hoppers, elevator casings, spouting, etc.

For a complete list of our line see a copy of our No. 45 catalogue. 800 pages of useful information to every engineer, designer plant owner or superintendent.

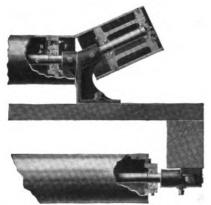
THE CONVEYING WEIGHER CO.

90 WEST STREET, NEW YORK, N. Y.

Ball Bearing Belt Conveyors; Continuous, Automatic Scales for Belt and Other Conveyors; Conveying and Hoisting Machinery; Complete Material Handling Plants; Trump Measuring and Mixing Machines; Trump Concrete Mixers

AGENCIES: Herbert Ainsworth, Esq., The Corner House, Johannesburg, S. Africa The A. M. Ellicott Co.. 338 St. James Street, Montreal, Canada Mr. Frank R. Perrot, Aberdeen House, 204 Clarence St., Sydney, N. S. W. Mr. Lucien Herman, 18 Rue Jules Van Praet, Brussels, Belgium Victor M. Braschi Machinery Company, Mexico City, Mex. Zimmer Conveyor Company, 82 Mark Lane, London, E. C., Eng. Manhattan Rubber Mfg. Co., 2017 Fourth Ave., North, Birmingham, Ala. Manhattan Rubber Mfg. Co., Hurt Bldg., Atlanta, Ga. Manhattan Rubber Mfg. Co., El Paso, Texas. Cameron & Barkley Co., Tampa, Fla. Cameron & Barkley Co., Charleston, S. C. Salt Lake Hardware Co., Salt Lake City, Utah. Norton Sales Co., Nashville, Tenn. H. W. Moore & Co., Denver, Colorada.

BALL BEARING BELT CONVEYORS:



"Conweigh" Ball Bearing, Troughing and Return Idlers for Belt Conveyors (Patents Pending)

We illustrate herewith the construction of ball bearing troughing and return idlers

for belt conveyors. It is guaranteed that if a belt conveyor running level be equipped with these idlers there will be a saving of 40° in power required. These idlers, having felt, oilretaining washers, need to be lubricated only once in two years.

A-Hardened steel "Cone" fitted on turned steel shaft.

B-Pressed steel "Ball Retainer."

C-Turned stee shaft, set screwed in Idler brackets.

D-Oiled washer of felt or carded wool.

E-Hardened steel "Plug" screwed into pulley hub.

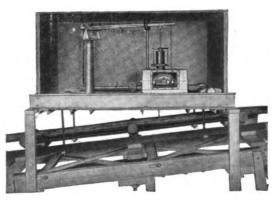
F-Brass plug for lubrication.

G-Lock screw to prevent hardened plug from turning.

MERRICK CONVEYING THE **WEIGHER:**

This device records the weight of material handled on belt conveyors, bucket conveyors, cable railways and overhead trolleys or telphers.

The weigher consists of a pair of weighing levers and a steelyard of special design so that a short section of the conveyor can be suspended from the weighing levers. The extreme end of the steelyard is connected with a totalizing me- 407 chanical integrator which derives its other factor from the travel of the conveyor by means of suitable gearing from a bend pulley on the return belt, or a sprocket wheel if on a bucket conveyor. This integrator continuously totalizes the product of two quantities, one proportional to the weight of material suspended and the other to the travel of this material. The result therefore represents the total weight of material and is plainly indicated by a register.



View of Conveyor Weigher. Front Sheet of Casing Removed

GIFFORD-WOOD CO.

MAIN OFFICE AND WORKS: HUDSON, N. Y.

SALES OFFICES AND STOCKROOMS CHICAGO, 565 W. Washington St. Boston, 51 No. Market St.

SALES OFFICES BUFFALO, Electric Bldg. New York, 50 Church St

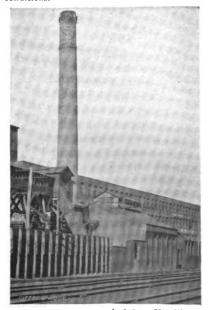
Manufacturers of General Elevating and Conveying Machinery for Handling Coal, Ashes, Stone, Sand, Gravel, Ice and bulk materials of all kinds. Pivoted Bucket Carriers, Belt and Apron Conveyors, Grain Elevator Machinery, Warehouse Conveyors, Wagon Loaders. Screens of all kinds, Friction Clutches, Gray Iron Castings, Hoists, Icing Station, Equipment, Etc.



Pivoted Bucket Carrier

408

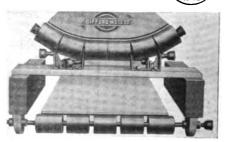
We install these equipments complete—carrier, bunkers, gates, crusher, apron conveyor and any other steel work made necessary by individual conditions.



Power Plant Coal and Ashes Handling Machinery



Continuous Bucket Elevators



Belt Conveyors G-W Conveyor Belts are manufactured to our own specifications and sold under the registered trade-names, Duralife and Goodworth. We furnish Belt Conveyors for all purposes.



Warehouse and Platform Conveyors

LINK-BELT COMPANY

PHILADELPHIA

CHICAGO

INDIANAPOLIS

Manufacturers of Elevating and Conveying Machinery for Every Purpose.

Power House Equipment. Power Transmission Machinery

Original Ewart Link-Belt. ➤ FLINT-RIM ≺ Sprocket Wheels, Link-Belt Silent Chain Drives, Power Transmission Machinery, Pillow Blocks, Friction Clutches.

Power House Equipment: Peck Overlapping Pivoted Bucket Carriers, Belt Conveyors, Coal Bunkers, Crushers, Chutes, Telescoping Ashes Elevators, Coal Storage Systems, Traveling Water Intake Screens.

Bridge Tramways, Locomotive and Gantry Cranes, Telphers, Electric Hoists, etc.



Link-Belt Locomotive Crane. Does the work of from 20 to 30 men in handling loose and bulky material of all kinds. Send for catalog No. 370.



Link-Belt Electric Hoist. An indispensable machine in any plant. Write for catalog No. 380.



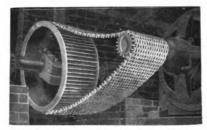
Link-Belt Elevators and Conveyors. There are standard Link-Belt Elevators and Conveyors for every service—for handling any material. Write for catalog No. 375.

Coal Tipples, Coal Washeries, Centrifugal Coal Driers, Car Hauls, Crushers, Screens, Picking Tables, Chutes, Wholesale and Retail Coal Yard Equipment, etc.

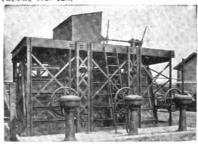
Locomotive Coaling Stations, Complete Freight Handling Equipments.

Package Handling Machinery.
Portable Wagon and Truck
Loaders, Portable Bag and Box
Piling Machines.





Link-Belt Silent Chain. For high speed power transmission. "Flexible as a Belt—Positive as a Gear—More Efficient than Either." Send for catalog No. 125.



Link-Belt Water Intake Screens. Screens water perfectly before it is circulated through Power Plant. Write for book.



The Peck Carrier for Handling Coal, Ashes, Sand, Stone, Clinker and Similar Material. There are many types of bucket carriers, each adapted to certain conditions shown in our catalogs Nos. 220 and 300.

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C. W. HUNT COMPANY, INC.

WEST NEW BRIGHTON, STATEN ISLAND, NEW YORK

BRANCH OFFICES

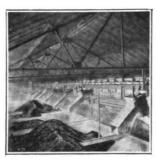
CHICAGO, 538 Dearborn St.

NEW YORK CITY, 143 Liberty St.

BOSTON, 29 Ferdinand St.

Manufacturers of Coal and Ash Handling Machinery, Pivoted Bucket Conveyors, Hoisting and Conveying Machinery, Cable and Automatic Railways, Skip Hoists, Industrial Railway Equipments, Electric Locomotives, Motor Cars, Transmission and Hoisting Rope, Special Scales and Weighing Hoppers, Coal Crackers

PIVOTED BUCKET CONVEYORS:

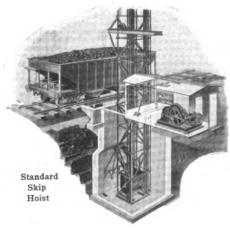


Upper Run of
Hunt Conveyor at
Omaha Electric Light &
Power Plant

Consist of a series of independent swinging buckets free to dump in either direction. Conveyors can run in any direction, the buckets hanging in an upright position, therefore dry or liquid material can be handled. The peculiar system of driving, by a pawl relieves the conveyor wheels of all stress.

Ask for Catalog U 15-4 on "Conveyors."

SKIP HOISTS:

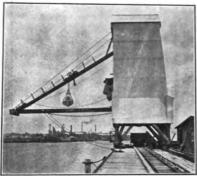


Consists of load-carrying bucket, wire hoisting rope, head and leading sheaves, electric single drum hoisting engine with motor, traveling cam control and electrically operated brake, bucket guides, loading pit valve or loading chute, control panel and push button station for operating machine.

Single bucket skip is counterweighted and guides constructed for properly guiding counterweight and bucket. Electric skips with drum type controller and steam hoist friction operated skips of high speed can be furnished if desired. Skip hoists can be operated equally well whether vertical or inclined.

Capacities from 25 to 300 tons per hour

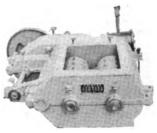
COAL HOISTING TOWERS:



Inclined Boom Hoisting Tower

The hunt towers are especially adapted for the rapid unloading of vessels. Furnished steam or electrically operated, one-man control; with hoisting capacity of from 100 to 300 tons per hour.

COAL CRACKERS:



Complete Coal Cracker

For breaking lump bituminous coal into pieces small enough to feed through automatic stokers. Rolls have renewable hardened steel chisel points that split or crack instead of crushing the lumps. Bearings and mechanism protected from dust. Cracker may be placed below hopper under railway car track, so that coal feeds directly from car into conveyor Can also be suspended from overhead beams, or be supported from below. Steam or electrically operated

C. W. HUNT COMPANY, INC.

INDUSTRIAL RAILWAY AND EQUIP-MENT:

Tracks—Laid on any form of floor or roadbed and can be run across or between standard gage railway tracks without cutting the rail heads, run out on trestles or in tunnels. Made up in sections of 20-ft. length with ties spaced every 24½ in. Rails are furnished either riveted to steel cross-ties or having cast tie plates integral with rail or knocked down steel track. Track gage from outside of one rail head to other is 21½ in.

Combination of switches are left- or righthand 2-way or 3-way, furnished with or without stands. Also, the above can be furnished in cast plate. Frogs, crossovers and turntables are also manufactured. Any workman of ordinary intelligence can put together a whole system ready for use.



Track Layout in Boiler Room

Cars—Bodies of various designs to meet a wide range of use, but all have essentially same truck construction. Axle bearings are either plain or roller bearing. Arrangement of running gear facilitates propulsion on short curves. Standard width for clearance of cars is 4 ft. Curve radius, 12 ft.

ELECTRIC LOCOMOTIVES:



Hunt Electric Locomotive

Narrow gage electric locomotives in connection with industrial railways further reduce cost of handling material. Designed to take full load around 12-ft. radius curves as easily as on straight track.

Various types of locomotives are made to pull loads up to 50 tons.

Standard machine as shown is built for any track gage from 18 to 36 in. Minimum curve radius, 10 ft. Rated draw bar pull, 800 lbs., at 4 miles per hour; steel wheels slip at 1600 lbs. starting pull. The operator is protected by sliding top on cab. Overall height from top of rail to top of cab, 52 in. Battery capacity ample for full day's work. Battery box easily removable for extra set of cells, for 24 hours' service.

MOTOR CARS:



Motor Driven Self-Dumping Car

Locomotives can be equipped with storage battery for motive power, or current can be taken from overhead trolley or from third rail. Motors and gears are housed to protect them from injury and dust. Speed, variable, from 1 to 10 miles

Also load carrying motor cars, 1-ton to 10-ton capacities

GATE VALVE:

Fig. shows a low body duplex valve with outside flanges particularly suitable for



ash hoppers. Low Body Duplex Valve
If the conditions are unfavorable for the operation of any other type of cut-off valve, these
duplex valves will be successful. They are
heavily built and are not quickly burned out.

OVERHEAD WEIGHING LARRIES:

Built to meet existing conditions with one way or bifurcated chutes to serve a single or double line of stoker hoppers. Accurate records of coal consumption registered on cards. Manually or electrically operated either from boiler room floor or cab. Capacities ½ ton and up.



Over-Head Weighing Larry

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THE JEFFREY MFG. CO.

904 North Fourth St., COLUMBUS, OHIO

BRANCHES

NEW YORK BOSTON PHILADELPHIA PITTSBURGH CLEVELAND MILWAUKEE CHICAGO SCRANTON St. Louis Denver Los Angeles Charleston, W. Va. BIRMINGHAM DALLAS DETROIT MONTREAL

Manufacturers of:

CONVEYERS—Apron, Scraper, Belt, Pan, Pivoted Bucket, Spiral and other types.

ELEVATORS—Tray, Barrel Arm, Bucket, etc.

CHAINS—All types for elevating, conveying and transmission purposes; Sprocket wheels, etc.

CRUSHERS, PULVERIZERS, SHREDDERS, PORTABLE LIME-PULVERS, ETC.

POWER TRANSMISSION MACHIN-ERY—Self-Propelling Loaders for handling loose material to wagons or trucks.

412 ERY EQUIPMENTS, including Coal Cutters, Drills, Pit Car Loaders, Locomotives, Car Hauls, Screens, Elevators, Conveyers, Picking Tables and adjustable Loading Booms, Ventilating Fans, Crushers, etc.





Patented

JEFFREY SINGLE ROLL COAL CRUSHER for Mine, Power House and Coaling Station. Reduces lump and run-of-mine coal to stoker size in a single operation. Catalog No. 141-I.



SWING HAMMER SHREDDER for the preparation of fibrous materials. Catalogs 245-D and 259-B.



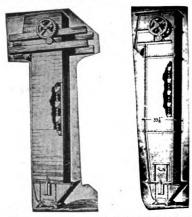
SWING HAMMER PULVERIZER for the reduction of raw and fibrous materials. Catalog 147-L.



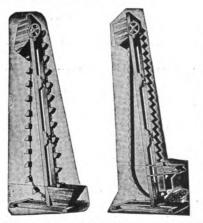
DOUBLE ROLL CRUSHER for reducing coal and coke. Bulletin No. 248-D.

THE JEFFREY MFG. CO.

COLUMBUS, OHIO



Catalog No. 244-S on JEFFREY STANDARD-IZED ELEVATORS contains over 40 pages of complete layouts and specifications.



Catalog No. 175-W features JEFFREY STANDARD BELT CONVEYERS for handling ores, coal, sand and gravel, merchandise, etc.



STORAGE BATTERY INDUSTRIAL LOCO-MOTIVE. Write for Catalog No. 231-K.

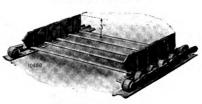


SELF-PROPELLING DIGGER AND LOADER for handling crushed stone, sand and gravel, acid phosphate, ashes, coal, coke, etc. Catalog 264-D.



Wood Apron Conveyer

413



Steel Apron Conveyer

JEFFREY STANDARD WOOD AND STEEL

APRON CONVEYERS for handling packages,
bags, barrels, boxes, and loose materials are fully
described in Catalog 258-L.



One of our standard types of SCRAPER CON-VEYERS for handling coal, etc. Catalog 257-C.

Our Catalogs on the various types of Jeffrey Elevating and Conveying Machinery are text books, containing valuable information, data and layouts for Engineers.

THE LAMSON COMPANY

GENERAL OFFICES

100 BOYLSTON ST., BOSTON, MASS.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

WORKS

LOWELL, MASS. TORONTO, CAN.

Builders of Pneumatic, Selective and Mechanical Carriers and Conveyors

Products:

Conveying Systems for Cash, Papers, Merchandise and Products for All Industries.

PNEUMATIC DISPATCH TUBE SYSTEMS.

CONVEYORS: Gravity Roller, Belt, Apron, Slat, Drag Chain, and Automatic Selective Power.

SPIRAL CHUTES; SPIRAL CON-VEYORS.

SELECTIVE OVERHEAD POWER CON-VEYORS.

Light Hand and Electric Power Elevators and Lifts; Electric Cable and Wire Line Cash and Parcel Carriers; Sectional Metallic Receiving and Storage Bins.

Adaptability of Lamson Conveying Systems:

Lamson automatic conveying systems are as varied as industry itself and are adapted for a wide range of usefulness in nearly every conceivable business.



In factories, labor and movement of materials are controlled through Lamson pneumatic tubes, which carry messages practically instantaneously,



In the shop, work orders and material orders are received from the main office a few seconds after they are issued, through Lamson pneumatic tubes. Above picture shows typical installation.



TRADE-MARK

They carry practically everything that is ordinarily handled—from papers, currency and the most fragile products, to boxes, barrels, tools, castings, machine parts, etc.

No matter what the business is Lamson conveying systems will save time and expense and enable the organization to perform more

work with less effort.

Lamson Service:

Specialists employed by this company are constantly solving all kinds of conveying and carrying problems, and their experience and service are at the disposal of those who desire a satisfactory solution of their conveying needs.

Full information covering any problem to which Lamson conveyors may be adapted will be furnished, without obligation.



Correspondence and important messages are quickly carried from office to office in the modern business house. Lamson pneumatic tubes are quicker and surer than messengers.



Checks, debit and credit items, and all manner of papers are sent from tellers to bookkeepers in a few seconds by Lamson pneumatic tubes.

THE LAMSON COMPANY



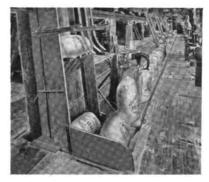
Gravity conveyors keep the stock moving between machines in the modern factory. Stock in process is kept down, and workmen are kept supplied continuously with material.



Lamson chain conveyors carry tote boxes of small parts quickly over long distances.



Two-way conveyor for quills in silk mill. This type of conveyor is admirably adapted for carrying all kinds of small articles in manufacturing plants.



Bags of flour and irregular shaped articles are easily carried by Lamson conveyors. Picture shows horizontal belt conveyor delivering to vertical conveyor.



Picture shows modern manufacturing plant completely equipped with Lamson gravity conveyor system. Finished products from all parts of the room go by way of the two-way conveyors to the inspection and shipping department. Workmen are constantly supplied with work, while finished work is carried away at once, and does not accumulate in aisles and at machines.

MYERS-WHALEY COMPANY

Incorporated

KNOXVILLE, TENNESSEE

AGENTS

F. A. Perry, 63 Queen Victoria St., London, E. C. 4 J. P. Cotter, P. Ö. Box 584, Sydney, Nova Scotia Arthur Leplastrier & Co., Sydney, Australia Ric C. 4 Dieny & Lucas, 50 Rue Taibout, Paris a Maskin K. Lund Co., Kristiania, Norway Richardson, McCabe & Co., Wellington, New Zealand



PRODUCT:

Manufacturers of the Whaley patented shoveling machines designed to handle bulk materials quicker and cheaper than hand shoveling.

416

DESCRIPTION:

An automatic shoveling machine consisting of a main frame, jib section and rear conveyor. The materials used in its construction are the best. Steel is heat treated and hardened when used for parts subject to heavy duty. Bearing parts are protected against dust and grit. Ample lubrication is provided and pressed steel grease cups and oil holes are conveniently located. Gears run in oil tight housings wherever possible.

All chains are steel. The conveyor chain is a specially designed steel roller type. Drive chains are the finished nickel-steel automobile type run on cut steel sprockets.

The conveyors are built for the special heavy duty. The strain is taken by steel roller chains; the abrasion of material is received by steel bars bolted to the best belt obtainable for the purpose.

PERFORMANCE:

The No. 4 machine, which is the standard size, loads an average of 200 to 300 tons of material per eight hour day including shifting of cars and moving machine. This corresponds to the output of twenty hand shovelers and costs but one-third as much.

SPECIFICATIONS, NO. 4 SIZE:

Weight-About 18,500 pounds in working

Track Gauge—18 inches and over. Balance rails used on gauge less than 42 inches.

Length—22 to 26 feet, depending on length

of mine car.
Width over all—5 feet 4½ inches.
Height—4 feet 9 inches and upwards—depending on height of mine car.
Wheel Base—42 inches.
Reach—10 feet to each side of center of track
Width of Shovel—34 inches.

with of Shovel—34 inches,
Power of Consumption—About 12 H. P.
Motor—20 H. P. for any commercial electric
current, or for compressed air.
Capacity—45 cubic feet per minute in loose
material. (12 R. P. M.)
Shipping Weight—About 23,000 pounds,

boxed for Export—In Three Cases: 226, 186, and 137 cubic feet, total 549 cubic feet,

approximately.

A FEW FEATURES:

- 1. Operated by electricity or compressed air.
 - 2. Machine operated by one man.
- 3. Self-propelled, forward or backward. 4. Equipped with either car or tractor wheels.
- 5. Track machines work on curved or straight tracks.
- 6. Shovel works on smooth or rough floor; or will spade material above floor, making its own bottom.
- 7. Material may be discharged behind or on either side of machine.

SERVICE AND REPAIRS:

Prompt service on repair and spare parts. Quantity production basis of manufacture assures you parts that fit. Consult us in your material handling problems.

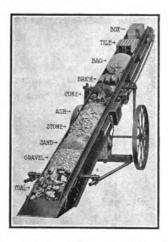
Send for complete catalogues.

PORTABLE MACHINERY CO.

PASSAIC, N. J.

THE SCOOP CONVEYOR:

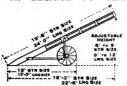
The Scoop Conveyor is an exclusive type of light-weight portable belt conveyor designed to be handled by one man and to assist the hand shoveler in moving loose materials such as coal, coke, ashes, crushed stone, sand, gravel, etc. It will also handle sacks, packages, boxes and manufactured products.



We call it Scoop Conveyor because the carrying belt receives its load over a scoop which can be pushed or completely buried into the material to be conveyed. This exclusive feature can be found on no other belt conveyor. The time labor and money saving features of the Scoop Conveyor are so apparent that a few figures will enable you to arrive at its saving over your present operating costs.

Specifications of Type "A" Scoop Conveyor:

DIMENSIONS—(See illustration). In addition to the sizes sho





sizes shown we make a machine 14 ft. long with the elevation adjustable from 4 to 6 ft.

WEIGHT— 1050Lbs.,Standard Size; 1350 Lbs., Long Size. H O R S E P O W E R—2 H. P., Standard Size; 3 H. P.,

Long Size.

GUARANTEE—We guarantee the carrying belt to handle at least 5000 tons of coal or 4000 tons of ashes or sand, making cost of belt renewals less than one cent per ton on coal and slightly over one cent per ton on ashes or sand.

In asking for further information, give full operating conditions, kind of material to be handled, from where will machine receive ma-



terial, to where will machine deliver material, kind of power available, etc.

Machines can be furnished with either electric motor, gasoline engine or without motor. We furnish motor installation instructions and carry in stock drive reductions for any motor speed from 700 R. P. M. to 1800 R. P. M.

Capacity and Method of Feeding:

The carrying capacity of the Scoop Conveyor based on handling coal is one ton in one minute, providing a sufficient amount of coal is maintained at the receiving end of the machine. If the storage pile is of considerable height, one man can readily feed one ton in one and one-half minutes. If the pile is low, he will require anywhere from two to four minutes to feed one ton. Where speed is required under unfavorable conditions two men may be provided for feeding.

In unloading hopper bottom cars the machine can be readily supplied to its full capacity of one ton per minute

full capacity of one ton per minute.

Large size coal, foundry coke and crushed stone fed from storage pile by one man requires anywhere from three to six minutes to feed one ton, or half that time if fed by two men.

THE TYPE "B" CONVEYOR:

Our Type "B" Portable Belt Conveyors are designed to handle a variety of material horizontally or at a slight incine. Material can be placed on the carrying belt at any point between the feed and discharge end. The machine is of strong and durable construction throughout, yet light enough in weight to make it portable. The closely spaced carrying rollers provide a belt support that will carry pieces weighing up to 200 lbs. The repairs or upkeep costs on these ma-

provide a bett support that with early pieces weighing up to 200 lbs. The repairs or upkeep costs on these machines are very low. All construction details are based on our experience in the manufacture of thousands of Portable Belt Conveyors.



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ROBBINS ENGINEERING COMPANY

390 OLD COLONY BUILDING, CHICAGO, U. S. A.

Robbins' Portable Conveying, Piling and Storage Systems are designed to handle every variety of commodity, whether in bulk or packages, in the most efficient manner. The sections interlock with each other and with the Pilers and may be coupled in any desired arrangement to receive the load at any point required and deliver it wherever desired.

These units are designed on a scientific basis maintaining ample strength to perform the service required and at the same time light enough to be truly and conveniently portable. Each unit is built for light upkeep and operating cost, and amply sturdy to give many years of the most grueling service.

Units are mounted on ball bearing casters and are easily moved for re-arrangement or to keep up to the work. For outdoor use, where casters are not practical, the Piler may be mounted on steel wagon gear or on special wheels. The framework is entirely of steel, cantilever construction.

Power units are furnished either with electric or air-cooled gasoline motors. The motion is reversible and the complete system changes from loader to unloader without being turned around.

Maximum capacity varies and is governed entirely by the rate at which material is fed to the receiving end and the size of packages. The carrying chains move about ninety feet per minute and we build conveyors any width from the standard of 22½" up to 48½" and any desired length, to handle packages weighing up to 700 pounds. Special equipment for much larger and heavier packages or material.

One man, with Robbins Equipment, can do as much work as five men working the old-time hand trucking and piling way. With a Robbins Piler it costs no more to pile thirty feet than to pile three feet.

We design and furnish belt and other types of fixed conveyors for every purpose as well as the portable apparatus illustrated on next page.

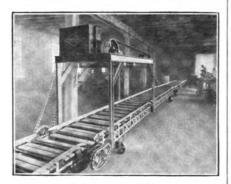
All equipment bearing the Robbins Engineering Company's name carries with it an unqualified guarantee as to material, workmanship and operation.

Besides the portable equipment illustrated. we specialize in fixed Handling and Storage Systems for coal, sand, ore. gravel, stone and other materials.

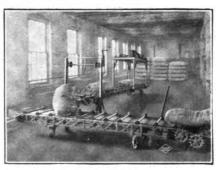
ROTARY CAR DUMPERS FOR STANDARD GAUGE RAIL,-ROAD CARS. ANY CAPAC- MECHANICAL TO THE CONTROL OF T

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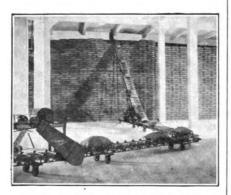
ROBBINS ENGINEERING COMPANY



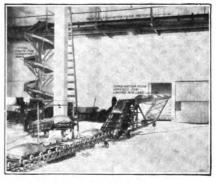
Conveyor with Power Section, Wood Aprons and Guard Rails over Rollers



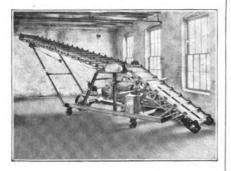
Conveyor handling bags with angle stand for turning corners. Handles boxes or barrels as readily as bags



Bags are piled forty high as cheaply as four. Handles boxes just as readily



Belt conveyor, spiral chute, portable conveyors and combination Piler loading freight cars



Combination type Piler, made any height up to forty feet to handle packages weighing up to seven hundred pounds



Special curved boom Piler made for handling boxes of hardware, barrels and bales of cotton weighing up to seven hundred pounds

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ROBINS CONVEYING BELT CO.

Manufacturers of Conveying Machinery

PARK ROW BUILDING, NEW YORK

CHICAGO OFFICE: Old Colony Bldg.

SALT LAKE CITY: Newhouse Bldg.

BIRMINGHAM: C. B. Davis Eng. Co.

SAN FRANCISCO: The Griffin Co.

TORONTO: Gutta Percha & Rubber, Ltd.



Robins Unloading, Stocking, Reclaiming and Conveying Equipment

The Robins Conveying Belt Company is prepared to design and install conveying machinery to meet any requirement. The machinery includes belt conveyors, bucket elevators, unloading towers, stocking and reclaiming bridges, coal or ore storage and reclaiming systems, coke cooling wharfs, ore bedding and reclaiming systems, standard and adjustable coal or coke crushers, and the auxiliary equipment such as chutes, feeders, screens of various types, etc.

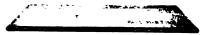
Robins machinery is handling coal, coke, ashes, ore, limestone, clinker, cement in bulk and in bags, wet concrete, sand, crushed stone, dirt, gypsum, phosphate rock, salt, grain, wood chips and pulp, rubbish, packages of all kinds and many other materials.



Robins Standard Troughing Idler

Robins machinery parts are fitted for compression grease cup lubrication to protect the bearings from dust and corrosion. Consequently, troubles resulting from these causes are practically eliminated under the most severe operating conditions.

Robins Conveyor Belts are made in a number of different grades of conveyor belting, both of the stepped-ply and straight-ply construction, each grade being designed to give the most economical service under certain operating conditions. If it is believed that none of the standard brands of belts will give satisfactory service because of unusual conditions, a special grade of belt will be designed for the work.



Robins Stepped-Ply Conveyor Belt

Robins stepped-ply belts have thicker rubber cover in the center than at the edges, thus giving more protection where the abrasion is greatest. A belt of this construction is flexible laterally, allowing it to conform to the shape of the troughing idlers, and causing it to run true even when empty.

The Robins "Handbook of Conveyor Practice" will prove of value to engineers who are planning for or designing conveyor installations. It contains a group of useful tables concerning capacities, power requirements, speeds of conveyors and similar matter; dimensions of conveyor parts, together with general data on conveyor practice. We will be glad to send a copy on request.

STANDARD CONVEYOR CO.

Formerly Minnesota Manufacturers' Assn.

OFFICE AND FACTORY: NORTH ST. PAUL, MINN.

EASTERN OFFICE: New York City 7th Floor, 227 Fulton St. DETROIT OFFICE: Detroit, Mich. 400 Penobscot Bldg. CHICAGO OFFICE: 549 W. Washington St.

Representatives in all Principal Cities

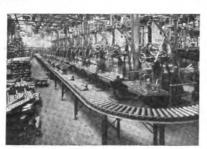
Manufacturers of Gravity Roller Conveyor, Automatic Straight Lift Elevator, Inclined Elevator, Gravity Spiral Chute, and Power Conveying Machinery for the Indoor Transportation of Boxed, Cased, and Packaged Merchandise

STANDARD GRAVITY ROLLER CONVEYORS: Are constructed of $2\frac{1}{2}$ dia. either steel or maple rollers; ball-bearing, side frames of $2\frac{1}{2}$ x $\frac{1}{18}$ angle iron.



Portion of Indoor Transportation System

This type of conveyor placed on 4% grade, conveys by gravity boxed and cased merchandise, lumber, brick, pig iron, and all commodities having one hard smooth surface to rest on the rollers.



Conveying Castings to and from Machine Operators on Standard Roller Conveyor

STANDARD GRAVITY SPIRAL CHUTES:

Are constructed on a scientific basis, permitting commodities of various forms, sizes, and weights to be lowered at a uniform rate of speed.

Standard Spiral Chutes are used for the economical lowering of merchandise from upper floors to lower floors.

STANDARD COMBINATION SYSTEMS:

Are comprised of Standard Gravity conveyor sections, Gravity spiral, automatic inclined power elevator, or power slat conveyors.

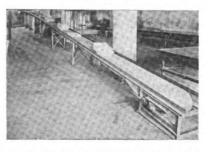
The combination of these units makes an ideal indoor transportation system reaching every part of warehouse, yard, or plant.



Standard Gravity Spiral Chute Lowering General Merchandise



Standard Combination Gravity and Power Slat Conveyor System



Conveying Bundles of Newspapers on Standard Belt Conveyor

WHATEVER—WHEREVER your conveying or handling problems are, there is a Standard Service at your command.

Experienced and practical engineering knowledge is back of every lay-out, drawing, or design submitted by our conveying efficiency engineers,

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WELLER MANUFACTURING COMPANY

GENERAL OFFICE AND WORKS

1820-1856 N. Kostner Ave., CHICAGO

BRANCH SALES OFFICES

NRW YORK

Boston

BALTIMORE

CLEVELAND

PITTSBURGH

SALT LAKE CITY

Designers and Manufacturers ELEVATING, CONVEYING AND POW-ER TRANSMITTING MACHINERY for

Cement Mills, Stone and Ore Crushing Plants, Coal Handling Systems, Sand and Gravel Washeries, Fertilizer and Phosphate Mills, Grain Elevators and Flour Mills, Cotton Oil and Cotton Mills, Starch and Glucose Factories, Tanneries, Brickyards, Glass Plants, Canneries, Paper Mills, Sugar Plants, etc.

CATALOGUE Y₃₅ SENT ON RECEIPT OF REQUEST.



422



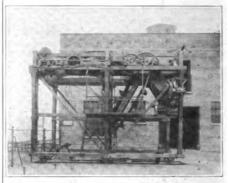
BELT CONVEYORS

For coal, stone, gravel, ore or any other loose material regularly made from 12 to 60 inches wide.



SHUTTLE TRIPPER FOR BELT CONVEYOR

Arranged to spread materials on either side of main belt conveyor. We have built this tripper with a spread of 120 ft.



THE WELLER GONDOLA CAR UNLOADER

Will handle run-of-mine and smaller coal, sand, gravel, etc., at the rate of about one car



COAL CRUSHERS

The heaviest, simplest and most efficient coal crusher on the market.

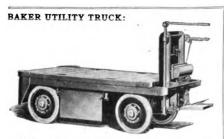


HEAVY LINE SHAFT EQUIPMENT Mounted on Iron Floor Stands

THE BAKER R & L COMPANY

CLEVELAND, OHIO

Manufacturers of Baker Industrial Trucks and Tractors and Raulang Electrics



4000-pound load-carrying truck, electrically driven, two or four-wheel drive, four-wheel steer.



4000-pound capacity load-carrying ftruck, electrically driven, two-wheel drive, four-wheel steer.



4000-pound capacity load-carrying truck of elevating platform type, electrically driven, two-wheel drive, four-wheel steer. An auxiliary electric motor elevates and lowers the load platform $4\frac{1}{2}$ " in 10 seconds.

BAKER SWIVEL HOIST TRUCK:



Truck capacity 4000 pounds, hoist capacity 1000 pounds or 1500 pounds; truck and hoist both electrically driven by separate motors.

BAKER INDUSTRIAL TRACTOR:



Rated drawbar pull 400 pounds, starting drawbar pull 1500 to 3000 pounds; two- or four-wheel drive, four-wheel steer. Speed 2 to 7 M. P. H. Will haul a trailing load of from 10 to 20 tons.

BAKER 3-WHEEL TRACTOR:



Rated drawbar pull 300 pounds, starting drawbar pull 1800 pounds. Speed 1 to $6\frac{1}{2}$ M. P. H. Trailing load from $7\frac{1}{2}$ to 15 tons.

BAKER JIB CRANE:

1500 pounds capacity. Both boom and load hoists are motor driven and separately controlled from the dash.

BAKER CARRYING CRANE:

4000-pound capacity; both truck and hoist driven by separate electric motors.

BAKER DUMP BODY TRUCK:

Capacity 1 yd. or 40 ft. side or end dump; truck electrically driven.

INTERSTANDARDIZATION OF PARTS BETWEEN MODELS:

98% of all parts on all models are identical and interchangeable. This reduces manufacturing costs and stocks of spare parts. In emergencies complete units may be transferred from one truck to another.

DESIGN AND CONSTRUCTION:

All parts are ruggedly constructed to meet the most severe usage. Every part has been specially developed for its particular service by engineers who have been building electric vehicles for more than twenty years.

Specifications and Descriptive Matter Furnished upon request.

THE LAKEWOOD ENGINEERING CO.

Methods and Machines

CLEVELAND, U. S. A.

DISTRICT OFFICES

NEW YORK CITY BOSTON PHILADELPHIA RICHMOND MEMPHIS ATLANTA DALLAS HOUSTON MILWAUKEE
CHICAGO
ST. LOUIS
INDIANAPOLIS
MINNEAPOLIS
DES MOINES
PITTSBURGH
CLEVELAND

BUFFALO
DETROIT
KANSAS CITY
SAN FRANCISCO
LOS ANGELES
PORTLAND
SEATTLE

LAKEWOOD CLAM-SHELL BUCKET:



Clam Shell Bucket

This bucket digs down as it closes, thus getting maximum load. Short cable overhaul gives quick handling. Guard idlers prevent cable wear, irrespective of digging position of bucket. Very

424 rugged construction, Adjustable counterweight for varying digging.

LAKEWOOD ELECTRIC TRACTOR:



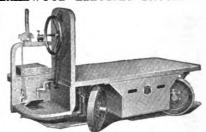
For use with trailers. Maximum tractive effort 3,000 lbs. Four wheel steer and drive. Maximum power on slippery floors. Sharp turns in narrow aisleways. Three speeds forward and reverse. Double end control.

LAKEWOOD ELECTRIC TIER-LIFT TRUCK:



A self-loading and unloading truck with a specially high platform lift. It picks up, transports and elevates its load by electric power. The high-lift enables it to be used to place jobs on work benches and machine tables; to unload freight cars and trucks from ground level. Fourwheel steer. Separate motor for elevating platform. Three platform heights; 42, 60 and 76 in.

LAKEWOOD ELECTRIC TRUCK:



Capacity, 4,000 lbs. Four-wheel drive and steer, same as Lakewood Tractor. Will negotiate 10% or 15% grades fully loaded.

LAKEWOOD ENGINEERING COMPANY

LAKEWOOD BALANCED TYPE TRAILER, MODEL 802:



Particularly adapted to general factory haulage where both power and hand trucking are necessary. Load being balanced on center wheels, minimum effort is needed to swing trailer around. Capacity, 8,000 lbs.

LAKEWOOD 4-WHEEL STEER TRAILER, MODEL 801:



Used where narrow aisleways and sharp turns make accurate trailing necessary. The 4-wheel steer coupler is reversible, thus enabling tractor to be coupled to either end. Capacity, 6,000 lbs.

LAKEWOOD CASTER TYPE TRAILER, MODEL 803:



Used where both hand and tractor handling are used. Trails more accurately than No. 802, but should be used only on smooth floors. Capacity, 5,000 lbs.

LAKEWOOD FIFTH WHEEL V-DUMP TRAILER, MODEL 806:



For power and hand trucking. Allsteel body can be locked in half-dumped position to reduce lift when hand-loading. No. 806 (1-yd. capacity), 1300 lb. load.

425

Prices—Lakewood prices are revised quarterly. There are no special discounts or concessions. A copy of the quarterly price list will be sent upon request.

LAKEWOOD MATERIAL HANDLING SERVICE:

A Lakewood Engineer will study your material handling problems with an absolutely open mind, make comprehensive study of conditions, and recommend only methods and equipment that will render the most efficient service to the client. His report will cover your present operating costs, changes recommended, if any, possible savings, and investment required. A conference with one of Lakewood's experts involves no obligation.

AMERICAN HOIST & DERRICK CO.

Works and Executive Offices: ST. PAUL, MINN.

BRANCHES

CHICAGO, 1113 Fisher Building NEW ORLEANS, 712 Union Street NEW YORK, 50 Church Street PITTSBURGH, 2119 Farmers Bank Building

SEATTLE, 1512 L. C. Smith Bldg.

Manufacturers of Steam, Electric and Kerosene Hoists, Steel Storage Cranes, Locomotive Cranes, Derricks, Wire Rope Clips, Blocks, Etc.

"AMERICAN" Self-Supporting Steel Crane:



Especially valuable in locations where there is not enough room for a guyed derrick. Crane illustrated above is 3-ton type with 50-foot radius. Height from ground to boom is 35 feet 6 inches. Operated by 5½ x 8 engine, mounted on rear of boom which gives operator unobstructed view of work.



Single piece gun-iron racer or revolving deck. Non-reversing, horizontal, double-cylinder hoisting engine. Turntable carried on 20 conical steel rollers working on a live ring, running in oil. Renewable steel roller paths. Highest grade fittings, steel canopy cab. "AMERICAN" friction clutches insure smooth operation. Simple lever system. Low center of gravity.

"AMERICAN" Steam Hoisting Engines:

Adapted to every kind of hoisting work. Single, double and triple friction drum types. Boilers ample

and quick steamers. Brake and friction at opposite ends of drum. Independent winch heads. Everything accessible.

"AMERICAN" Steel Stiffleg Derricks:

Excellent for permanent installations. Strength |off built-up steel members can be figured with accuracy. Mast,

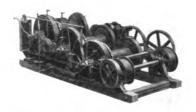


boom and stifflegs of structural steel, built up to develop the full strength of the material and obtain maximum stiffness.

Boom swings through 270 degrees. Bull wheel furnished unless otherwise specified. Sheaves have bronze bushings, run on centerbored axles, lubricated from compression grease cups.

"AMERICAN" Derrick Electric Hoists:

Two friction drums for hoisting. Two reversing drums for slewing. Counterweight drum for grapple work, one winch head. Automatic roller rachet brake prevents accident if current is suddenly shut Designed to meet all requirements.



Genuine "CROSBY" Wire Rope Clips:

Drop forged steel-high steel wings-broad grooved base, galvanized. Most dependable wire rope clip on the market. Cheapest because safest. None



genuine without "CROSBY" imprinted on

Owing to the brief space, no attempt at detailed description has been made, but a brief suggestion of our line only. Complete information upon request.

S. FLORY MANUFACTURING CO.

MAIN OFFICE: BANGOR, PENNA.

NEW YORK OFFICE: 95 LIBERTY ST.

HARTFORD, CONN. K. B. Noble Co. CHICAGO Monadnock Block PITTSBURGH
First National Bank Building

STEAM, ELECTRIC AND GASOLINE DRIVEN HOISTS FOR ALL MINING AND ENGINEERING PURPOSES

MINING HOISTS:

Made in all sizes and types for any mining service.

Cone or Band Friction (Werner Patent Band Friction) gives absolute control and eliminates all stress in drum shaft.

MARINE AUXILIARIES:

Steering Engines, Windlasses, Winches, Capstans, Dock Hoists, Marine Railway Engines, Dredging Machinery, Spud Hoists, Cleats, etc.

CONTRACTORS' EQUIPMENT:

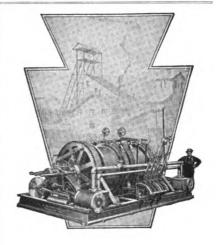
Derrick Hoists and Fittings, Drag Line Engines, Boom Swingers, etc.

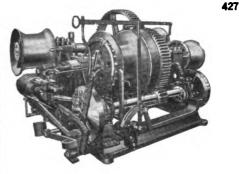
CABLEWAYS:

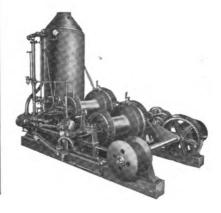
For Bridge and Dam Building, Removing Top, Conveying Material, Sewer Building, etc.

OUR ENGINEERS are fully competent to figure with you, on your requirements, by reason of years of experience.

Catalogues sent on request.







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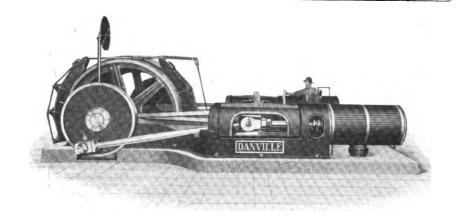
ROBT. HOLMES & BROS.

(Incorporated)

Successors to Danville Foundry and Machine Co.

DANVILLE, ILLINOIS, U. S. A.

Engineers, Founders, Machinists and Boilermakers



428

Danville Hoisting Engine

BUILDERS OF:

DANVILLE Hoisting and Haulage Engines, first and second motion.

Halbert's Patent Self Dumping Cages.

Ray's Patent Self Dumping Cage.

HOLMES' Shaker Screen.

HOLMES' Telescoping End Loader.

HOLMES' Patent Weigh Hopper.

HOLMES' Automatic Car Lift for Mine Bottoms.

Sheave Wheels for Hoisting and Haulage, with plain turned grooves or with removable steel grooved liners.

Iron, bronze and brass castings of all descriptions.

Heavy iron and steel forgings.

All kinds of Plate Metal Work, pertaining to Coal Mines.

Also Wholesalers and Retailers of Mill and Mine Supplies.

We also Build Special Machinery to Suit Your Requirements.

LIDGERWOOD MANUFACTURING CO.

MAIN OFFICES

96 LIBERTY ST., NEW YORK

CHICAGO, Fisher Building SEATTLE, 65 Columbia Street BRANCH OFFICES:

LONDON, ENGLAND

PITTSBURGH, Union Bank Building PHILADELPHIA, Widener Building Los Angeles, Central Bldg.

Manufacturers of Steam Hoisting Engines, Electric Hoists, Gasoline Hoists, Derricks, Cableways, Dredging and Excavating Machinery, Mine Hoists, Logging Machinery, Ship and Dock Winches, Steering Engines, Towing Engines

FOREWORD:

The Lidgerwood hoisting machinery of today embodies every improvement in design and construction developed by our 47 years' experience.

We design the complete machine to operate under the maximum service it is to perform, and build every part to meet the full working capacity of the machine.

Every part is accurately constructed upon the duplicate part system, insuring the absolute fitting of repair parts.

We have kept pace with the development of electrical engineering, and can supply our electric hoists equipped with the latest automatic control and safety devices, and type of motor best adapted for the work to be done by the hoist.

Our friction drum hoists have cork inserted friction woods. This increases the holding power of the friction and greatly reduces the power required to apply the friction. The entire friction mechanism is extremely simple.

STEAM, ELECTRIC AND GASOLINE HOISTS for all kinds of derrick service, including grab bucket work.

STEEL DERRICKS of all types; derrick fittings for wooden derricks.

PILE DRIVING HOISTS, pile driving frames and hammers.

HIGH SPEED BUILDERS' HOISTS for operating material and hod elevators.

STEAM AND ELECTRIC HOISTS designed for shaft and tunnel work, bridge erection and to meet every requirement of contracting work.

DREDGING AND EXCAVATING MA-CHINERY. Steam and electric bucket and swinging engines for operating both grab and scraper buckets on land and water outfits, both for dredging and for loading and unloading sand, gravel and coal barges.

Spud engines and cutter engines for suction dredges, built with special regard to the severe duty such machines perform.

STRAIGHT LINE CABLEWAY EXCAVATORS, steam or electric driven, with traveling towers, built in spans to meet service required. Operate drag scraper, or grab buckets. The high conveying speed enables them to excavate material rapidly and economically over wider areas than it is practicable to reach with the revolving type of excavator. Have handled 55 trips per hour, over a reach of 500 feet, using a three cubic yard scraper bucket.

CABLEWAYS: Lidgerwood cableways, steam or electrically driven to handle loads of from one to fifty tons, with spans up to 3,000 feet and with stationary or traveling towers. A prominent feature is the high speed fall rope carrier.

MINE HOISTS for every character of incline haulage and mine shaft service. Steam hoists built up to 1000 H. P. and electric in any size, and fitted with complete control and safety appliances.

LOG HANDLING SYSTEMS: High speed ground and overhead log skidding systems.

RAPID UNLOADERS for unloading ballast cars.

CAR HAUL HOISTS.

INCLINE COAL HOISTS.

COAL TOWER BUCKET AND TROLLEY HOISTS.

SHIPS' CARGO AND DOCK WINCHES. Steam and electric; a type designed for each method of cargo handling.

STEERING ENGINES of all types.

TOWING ENGINES. Maintain a constant stress on hawser.

Catalogs upon request. Engineering staff at your service.



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INDUSTRIAL WORKS

BAY CITY, MICH.

BRANCH OFFICES: 50 Church St., New York, Widener Bldg., Philadelphia, McCormick Bldg., Chicago and Book Bldg., Detroit.

Builders of Locomotive, Erection and Wrecking Cranes; Gasoline Coaling Cranes; Gantry Cranes; Pillar Cranes; Transfer Cranes; Pile Drivers; Transfer Tables; Portable Rail Saws; Grab Buckets; Lifting Magnets; and Pile Driver Steam Hammers

AGENTS: C. B. Davis Engineering Co., Birmingham, Ala.; J. G. Miller, St. Louis, Mo.; F. H. Hopkins & Co., Montreal, Que., and Toronto, Ont.; Northwestern Equipment, Portland, Ore., and Seattle, Wash.; N. B. Livermore & Co., San Francisco, Cal.

INDUSTRIAL WORKS was founded in 1873 and "Industrial" Cranes of to-day are the development of over forty-six years' experience. Satisfactory service under widely varied conditions of service has proved that they are fundamentally correct in design, sturdy in construction and efficient in operation. In size they range from 2-ton hand operated cranes to wrecking cranes of 160 tons capacity.

LOCOMOTIVE CRANES:

430

"Industrial" Cranes, steam, gasoline or electrically operated, are made in capacities of from 5 to 160 tons, and with booms from 20 to 125 ft. long. They are

buckets, hook and block, lifting magnets, or arranged for operating with a drag-line bucket, pile-driver leads or a steam-shovel dipper arm.

Mechanically, "Industrial" Cranes are not excelled. Every essential part of the entire crane is made, assembled and tested in our own extensive shops. All parts of the crane are accessible for easy examination, a large man being able to pass through the machinery part and car to the ground. Absolute interchangeability of parts is assured by the use of jigs and templates at every possible point in the construction. Inconvenient bearings are lubricated through oil pipes. The propelling gears on 8-wheel cars are placed in or out of mesh from the outside of the



A FLEXIBLE SYSTEM

Coal may be handled with the crane:

- I. From cars to bunkers.
- 2. From cars to stock pile.
- 3. From stock pile to bunkers.

mounted on four- or eight-wheel cars for standard or special gauge track, or on boats or gantries. Being self-propelling they can switch several loaded cars. These cranes may be used with grab car body. For clam-shell bucket work, both drums are independent and the auxiliary take-up drum for the holding line is automatic in its action, requiring no attention from the operator.

INDUSTRIAL WORKS

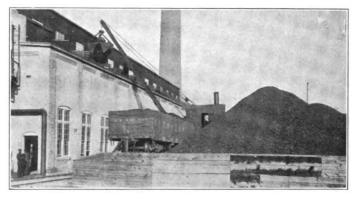
CHART OF MAXIMUM RADII IN FEET FOR BUCKET OPERATION

Crane Operating without Outriggers or Blocking

This chart contemplates use of maximum boom lengths as shown and would be subject to slight change if other lengths of boom are used. If special conditions involved are not covered by this chart consult with us.

Weight of coal used, 1400 lbs. per cubic yard Weight of sand used, 3200 lbs. per cubic yard

	Power Wheel				High Power Scraper				Multi-Power	
Capacity in Yards	% Yd.	1 Yd.	1½ Yd.	2 Yd.	3/4 Yd.	1 Yd.	1 1/2 Yd.	2 Yd.	1½ Yd.	2 Yd.
Max. Boom L'vth Type "A" 27'-6' Type "EA" 50'-0' Type "G" 60'-0' Type "H" 70'-0' Type "L" 70'-0'	O Z 17 42 36 50 49 60 52 63 55	50 44 56 47	32 26 44 35 47 37 50 42 58 47 62 51	40 32 44 35 51 41 55 44	38 33 50 44 55 48 57 51	35 30 47 40 50 43 54 46 61 53 66 58	31 25 42 34 45 36 49 41 56 46 61 50	1000 Puss 40 32 45 35 51 41 56 45	55 46	38 32 43 35 49 34 53 43



Direct from Car to Overhead Bunkers

Data:

In general all sizes of locomotive cranes do the same kind of work, the amounts being limited, of course, by their capacities. The 60-ton capacity cranes are used chiefly for erection purposes; those from 20 to 40 tons for erection work or for handling large quantities of material with a bucket or magnet; cranes from 5 to 20 tons are general purpose machines, and are in general use for all kinds of loading and placing of material.

Locomotive cranes are usually rated according to their maximum free capacity at the minimum radius (about 12 ft.). The table gives the approximate radius in feet at which various size cranes will

handle clam-shell buckets full of coal and sand. (A $1\frac{1}{2}$ -cu. yd. bucket holds approximately one ton of coal.)

To unload material with a grab bucket from the far end of a modern gondola car standing on the same track as the crane requires a 50-ft. boom. In general, the shorter the boom, the easier and faster will be the operation of the crane.

WRECKING CRANES:

"Industrial" wrecking cranes have been standard since 1883. Built in capacities of 75, 100, 120, 150 and 160 tons.

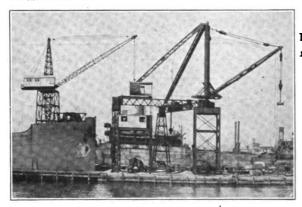
Member of Material Handling Manufacturers' Association.

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TERRY MANUFACTURING COMPANY

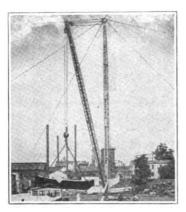
GRAND CENTRAL TERMINAL, NEW YORK CITY

Manufacturers of Material Handling Equipment



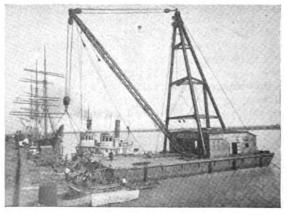
Hinged Boom, Revolving, Traveling Tower Cranes up to 50 Tons Capacity

STIFF LEG DERRICKS
Steel or Timber
All Capacities
up to 100 Tons





Guy, Jinniwink and
Barge Derricks
Standard Types
Steel and Timber
Capacities
up to
100 Tons



Derrick irons and fittings for timber derricks carried in stock.

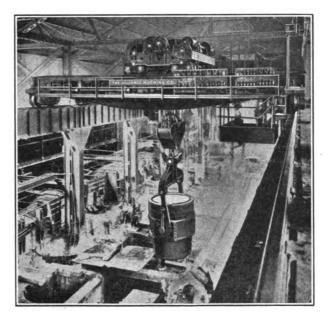
THE ALLIANCE MACHINE COMPANY

ALLIANCE, OHIO

PITTSBURGH

BIRMINGHAM

Engineers and Builders of Electric Traveling Cranes and Machines of All Types for All Purposes; Ore Bridges; Rolling Mill and Hydraulic Machinery; Riveters, Steam Hammers, Heavy Punches and Shears; Coke Plant Machinery, Scale Cars and Charging Larries; Copper Converting Machinery



433

"ALLIANCE" ELECTRIC TRAVELING CRANES:

The above illustration shows a 200-Ton Single Trolley Crane Ladle design furnished by us for Carnegie Steel Co. A duplicate of the above crane has recently been installed without a single change.

To substantiate the claim that the Alliance Machine Co. is the largest builder of the World's Largest Cranes, we submit the following list of large and special cranes designed, built and in

3-430 ton capacity, 90 ft. span.

operation:

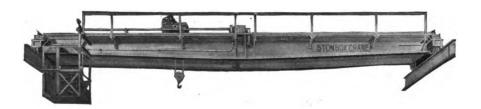
Heavy (Cranes							
56	29125 Ton							
980 Ton	19150 Ton							
190 Ton	12175 Ton							
50100 Ton								
	1250 Ton							
Soaking Pit								
10 5 Ton	512½ Ton							
	1115 Ton							
410 Ton	220 Ton							
325 Ton								
Strippers								
7100 Ton	10200 Ton							
17150 Ton								
Slab Charing Machines Crane and Floor Type								
11 1 Ton	11 5 Ton							
	8 8 Ton							
8 3½ Ton	415 Ton							
Combination Charges and Strippers								
2100 Ton	3150 Ton							
4								

ALFRED BOX & COMPANY, INC.

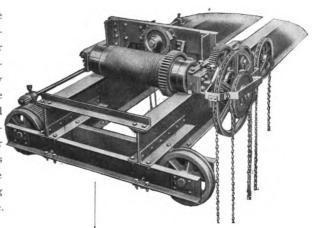
Established 1878

PHILADELPHIA, PA.

Electric Traveling Cranes, Jib Cranes, Bucket Cranes, Hand Traveling Cranes, Monorail Systems, Electric Hoists, Trolleys, Chain Hoists and Electric Winches



Manufacturers since
1878 of hoisting machinery exclusively. Our
line of standard equipment and the many
special designs we have
built to meet special
conditions and the experience gained in over
40 years in this line fits
us particularly to take
care of any hoisting
problem that may arise.





Electric Travelers to 40 tons capacity
Hand Power Travelers to 50 tons capacity
Jib Cranes of all descriptions

Our standard line comprises:

Electric Hoists from ½ to 15 tons and all possible combinations

Chain Hoists and I-Beam Trolleys

We would be pleased to send bulletin
showing our complete line.

"Box Cranes are built with the experience of years."

THE BROWN HOISTING MACHINERY COMPANY

CLEVELAND, OHIO

NEW YORK: 50 Church St. CHICAGO: 208 S. LaSalle St.

PITTSBURGH: Oliver Bldg. SAN FRANCISCO: Monadnock Bldg.

Engineers and Manufacturers of Locomotive Cranes, Heavy Dock Machinery, Bridge Cranes, Etc., as well as smaller Cranes and Hoists

COAL AND ORE HANDLING MACHINERY:

BROWNHOIST

desired. We install the systems complete, using the well-known

Brownhoist trolleys, which are recognized as the standard trolleys. Operated by electric or hand power.

Bridge tramways, fast plants, cantilever cranes, gantry cranes, furnace hoists, larries, transfer cars, bins, car tipples, and pig iron breakers. These

machines are designed for the rapid handling of material and a long service. They are installed in many parts of the world.

LOCOMOTIVE CRANES:

Eight- and four-wheel and for any gauge track; speediest locomotive crane built; equipped with M. C. B. couplers, standard trucks and fittings, steam brake, all steel gears; can be fitted with either a bottom-block, any kind of bucket, shovel attachment, magnet or piledriver, all interchangeable in a short time; easily operated; fitted with steam or electric power or with an internal combustion engine.

BUCKETS:

Grab buckets, two and single rope; drag line buckets; contractors' clam shell buckets; slag buckets; and tubs. The designs of these buckets are such that they get a full load each time and are under the control of the operator at all times. The best of material is used throughout, giving strength and durability to the spades, bearings, and digging edges.

TRAMRAIL SYSTEMS:

These systems handle all the material overhead, reaching every floor in each building and as much yard space as

OVERHEAD HAND TRAVELLING CRANES:

Furnished in various capacities and spans. Built for easy operation, safety, and low headroom. They are easily and quickly erected. Prompt shipment can be made. Operated with hand hoist, air hoist, or electric hoist.

FREIGHT HANDLING EQUIPMENT:

This includes several different machines designed for handling the freight at a much reduced cost over the present methods. The freight is handled overhead from car to sorting platform, warehouse, wagon or other cars. It requires just a few men, eliminates confusion and costly mistakes, and increases the terminal capacity.

CONCRETE REINFORCEMENT:

Ferroinclave is a patented corrugated sheet steel used as a reinforcement for concrete. It requires no forms during erection, and is easily laid by the workmen. It is used for concrete roofs, floors, bins, walls, partitions, silos, bridges, stairs, etc.

We also make power scraper shovels, work-car cranes, jib cranes, pillar cranes, bridge cranes, crabs, winches, transfer tables, and water-closet shields.

OURABYTE IN MECHANICAL ENGINEERING THE ASSOCIATION A SME

Catalogs and Prices
Furnished on Request

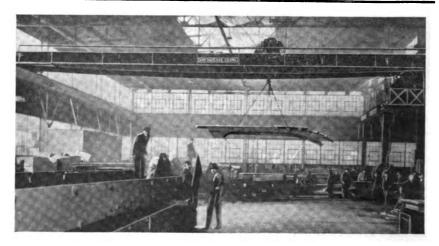
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CHESAPEAKE IRON WORKS

BALTIMORE, MD., U. S. A.

NEW YORK OFFICE: Woolworth Bldg., N. Y. City Manufacturers of Electric Cranes; Steel and Iron Work



A 5-ton, 76 ft. 6 in. Span Chesapeake Crane at the Baltimore Drydock and Shipbuilding Co., Baltimore, Md.

436 STEEL CONSTRUCTION:

The Chesapeake Iron Works undertakes contracts for the manufacture of steel buildings or similar structures of all sizes. We contract to furnish the steel and ship the fabricated pieces for the purchaser to erect himself or we will undertake the complete design and erection of the building. Detailed information or estimates on request.

THE CHESAPEAKE CRANE:

Details of Construction:

Bridge: Girders for cranes of moderate size are of braced I-beam construction, proved by experience the most efficient. For cranes of heavier capacity or larger span, the girders are of the box section type, cover plates and chord angles being full length (no splice). Stiffener angles of full depth of web are liberally employed.

Trolleys: Are built to meet the most exacting demands that can be made on cranes—being extremely heavy in all details and most accessible in all parts.

details and most accessible in all parts.

Brakes: The foot brake is powerful, of the brake band type which can skid the truck wheels when the crane is under full load. Mechanical Load Brake is of powerful double disc type which positively controls the load, preventing lowering except by hoist motor. Solenoid Brake has equal holding power in either direction without use of load brake when current is off.

All gears and pinions are cut from solid steel. The bearings are bronze bushed and supplied with grease lubrication. Through bolts with "Grip" nuts are used all over the mechanism.

Bottom Block: Is built of heavy structural steel, with bronze bushed sheaves machined to suit the hoisting rope with heavy steel shaft lubricated through grease receptacles machined in shaft. The hook, of forged steel, revolves on high grade ball bearings.

Safety First Features: The Chesapeake Crane embodies all necessary safety first features among which are switchboard in steel cabinet;

—limit switch preventing overhoisting, is operated by hook block in conjunction with no-voltage contactor on switchboard. Push-button for re-set is in front of operator;

—all gears are enclosed or suitably protected:

—bumper blocks and rail sweeps are placed on bridge ends;

—all parts are easily accessible to inspection and are easily removed for repairs;

—the cage is of heavy steel angles, well braced.

CRANES FOR EXPORT:

In order to reduce the cost of tariff on cranes built for export, we can, when desired, make certain changes and omissions, which, while not reducing the operating efficiency of the crane, will considerably lower the cost.

THE MORGAN ENGINEERING CO.

MAIN OFFICE AND WORKS, ALLIANCE, OHIO

Designers, Manufacturers and Contractors

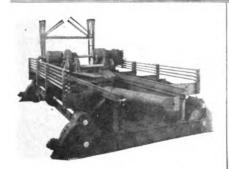
BRANCH OFFICES

NEW YORK

PITTSBURGH

CHICAGO

BIRMINGHAM, ALA.



Morgan Open Hearth Charger

Built in either High, Low or Overhead Types.

Open Hearth Charging Cars and Boxes.



Morgan 4 Girder Type Ladle Crane

Main Hoist of the two motor twin interlocking drum type, equipped with Patented Mechanical Equalizing Mechanism for equalizing load on hoist motors in hoisting and lowering directions.



Morgan Standard Mill Type Crane

Built for any capacity and span. Especially designed for Heavy Duty and High Efficiency.



Morgan Screw Type Ingot Stripper

Built with single or double stripping mechanism. With or without auxiliary hoist.



Morgan Low Stiffleg Type Vertical Charger

Especially designed for Heavy Duty. With or without Auxiliary Hoist.



Morgan Revolving Type Slab Charger

Furnished with side or end grip tongs. Floor or Overhead type.

Bulletins, specifications and prices furnished on request.

NEW JERSEY FOUNDRY & MACHINE COMPANY

90 WEST ST., NEW YORK

Manufacturers of Overhead Carrying Devices

ELECTRIC
AND
HAND POWER
TRAVELING CRANES

STATIONARY
SINGLE AND DOUBLE LEG
GANTRY CRANES

WALL CRANES

JIB CRANES

438

I-BEAM TROLLEYS

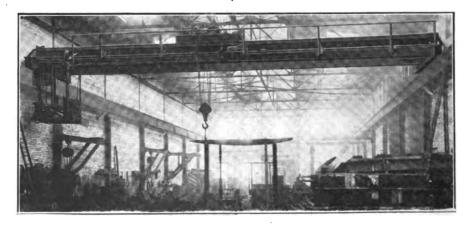
CRANE TROLLEYS

BEAM HANDLERS

SPECIAL CRANES



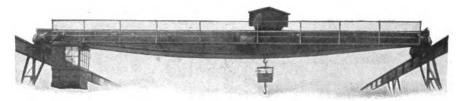
Our Catalog 88 contains detailed information on our line of Overhead Carrying Devices, Tracking, Trolleys, Hoists, Cranes, Buckets, Cars, etc. Two representative installations are shown above. Many others illustrated in catalog. A copy will be promptly sent on request.



NORTHERN ENGINEERING WORKS

DETROIT, MICH.

Manufacturer of Electric Traveling Cranes, Electric and Hand Cranes of All Types,
Hoists and Machinery



ELECTRIC CRANES AND HOISTS

NORTHERN CRANES

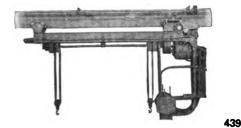
Northern Crane Products have been in use for over twenty years—Northern Hoists for nearly as long. In purchasing Northern Cranes or Hoists the buyer has behind his purchase an established firm of experience and responsibility. The designs have been kept up-to-date in both safety and convenience features.

Good service is assured every purchaser.

We make also

ELECTRIC HOISTS
AIR HOISTS

Catalogs and Bulletins free on request.









Northern Special Type E-100 Ton Trolley

PAWLING & HARNISCHFEGER CO.

GENERAL OFFICES AND WORKS: MILWAUKEE, WIS.

NEW YORK
PHILADELPHIA
NEW ORLEANS

PITTSBURGH CHICAGO PORTLAND, ORE. SAN FRANCISCO LOS ANGELES SKATTLE

Manufacturers of Traveling Cranes, Hoists, Monorail Systems, Builders of Drilling and Boring Machines, Excavators, Backfillers; Tampers

P. & H. CRANES:

We dared to build what seemed to be expensive cranes. The continuous, reliable service obtained from them has now proven to over 6000 users of P. & H. cranes that they are relatively cheaper than the many low-price cranes. Our policy, established 36 years ago, is to design and build our product with scrupulous care and of the best obtainable materials. We have accomplished one of our ambitions—"P. & H." on a crane now instills confidence and trust—its dependability is never in doubt to the man in the shop or the man in the office.



440 Design and Construction:

Refinement of design and construction make the P. & H. crane an old and faithful servant. All parts are accessible for cleaning, oiling or repairing. Liberal design gives real durability. All gears are of the spur type, no planetary gears; they are cast steel with forged and heattreated pinions. They are submerged in grease and enclosed in oil-tight cases, except such gears as truck gears, which are guarded.

No stud or machine bolts are used-through bolts are P. & H. standard.

All bearings are bronze bushed; trolley and bridge bearings are M. C. B. type.



Multispeed controllers, arranged for perfect speed regulation and convenient operation, require no great physical effort and limit the danger of arcing switches. On the larger size cranes, controllers are operated through master switches. Brakes used are of the dynamic, solenoid clam shell, and disc load type. P. & H. cranes are also provided with an automatic self-resetting limit switch.

P. & H. Drums are designed to give your rope its maximum life for they are not less than thirty times its diameter and will take full run of rope with no overlap for the specified lift.

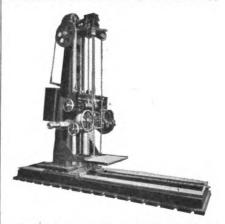
P. & H. cranes also include devices for the safety, comfort and convenience of your plant and workmen.

There is probably a P. & H. crane in use for every condition or service now existent

You are assured that any crane of a known type purchased from us will not be an experiment. If you must experiment with a crane for a service unparalleled at present why not permit the P. & H. engineering staff, careful experts in the design and construction of all types of cranes, to offer you a solution.

Let us send you catalogues of the type crane you are interested in.

DRILLING AND BORING MACHINES:



Having had use for machines capable of operating on bulky and odd parts in our own shops and being unable to get satisfactory apparatus outside, we built the P. & H. line of drilling and boring machines. We liked them so well and found them so convenient that we have placed them among the list of our products. If your production costs for drilling or boring are high P. & H. equipment will lower them.

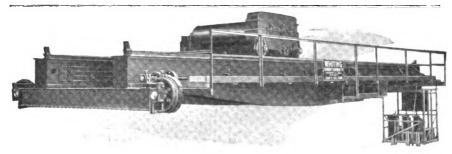
Send for descriptive literature.

WHITING FOUNDRY EQUIPMENT CO.

HARVEY (CHICAGO SUBURB), ILLINOIS

Representatives in 25 Principal Cities

Manufacturers of all Types of Cranes (Electric and Handpower Travelers; Bucket Cranes; Gantry Cranes; Jib, Pillar and Bracket Cranes); Complete Equipment for Foundries, Including Cupolas, Cupola Charging Machines, Steel Converters, Ladles of all Types, Tumbling Barrels, Core Ovens, Trucks and Cars, Malleable Furnaces, Annealing Ovens, Brass Furnaces, Air Hoists, Elevators, Turntables, and Tramrail Systems. Also Locomotive and Coach Hoists for Railroads, Turntable Tractors, Transfer Tables and Car Wheel Foundry Equipment



Standard 3-Motor E. T. C. 35-Ton Capacity, M. C. B. Truck Wheel Bearings

ELECTRIC TRAVELING CRANES:

For any span or lift, 1 to 250 tons capacity, A C. or D. C. Motors. Designed to suit customer's particular conditions. Standard details are result of over 35 years' engineering and manufacturing experience in building cranes and heavy

Our type "R" trolley for electric cranes is a compact, accessible unit that has been approved a compact, accessible unit that has been approved by steel-mill engineers as meeting all Safety-First requirements. All gears are cut from solid steel stock and are totally enclosed, operating in oil. Each gear with its shaft may be removed without disturbing other parts.

A mechanical or load brake is built right into the hoisting train, which makes it totally enclosed and operating in oil. Mechanical brake may be adjusted from the outside without opening the gear case

All bearings are bronze bushed and those for same size shafts are interchangeable.

Refer to clearance sketch below in requesting prices.

BUCKET AND GANTRY CRANES:

Various types for a wide range of service.



1 to 40 tons capacity. Single or double I-Beam bridges with chain block or rope-drum hoists, operated by pendant hand chains

JIB, BRACKET AND PILLAR CRANES:

Various types, operated by hand, electric motors or air hoists.

Cat dog 151 gives full details.



Two 150-Ton Whiting Electric Traveling Cranes, Chesapeake & Ohio R. R., Huntington, W. Va.

c

DATA FOR INQUIRY: Span (ft. & in.)...A Lift, floor to rails..B Overhead clearance C End clearance.....D

Kind of electric current. In-OUR ADVIS DE side or outside ser-ENGINEERING vice.

SHEPARD ELECTRIC CRANE & HOIST COMPANY

NEW YORK
PHILADELPHIA
PITTSBURGH
CHICAGO
BOSTON

MAIN OFFICE & WORKS

MONTOUR FALLS, N. Y.

BALTIMORE SAN FRANCISCO CLEVELAND MONTREAL LONDON BARCELONA

SEATTLE GENOA DETROIT PARIS CINCINNATI STOCKHOLM CHRISTIANIA HAVANA

Genoa Paris Stockholm Havana Melbourne

For Direct and Alternating Currents, Electric Hoists and Monorail Cranes in Capacities of 1/2 to 30 Tons; Electric Traveling Cranes I to 50 Tons; Double Monorail Track; Trolleys; Electric Back Geared Winches; Cargo Handling Winches

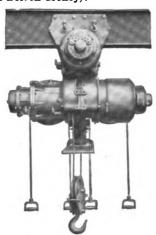


THE SHEPARD LINE IS COMPLETE:

Shepard Cranes and Hoists are handling materials in many and varied industries. The selection and extension of this equipment has been largely governed by the evident superiority of the design and the new standard of reliability in service which it has established.

SHEPARD Handbook—describing the complete line—will be sent on request.
Write for it Now.

FLOOR CONTROL D. C. HOIST (with Motor Driven Trolley):

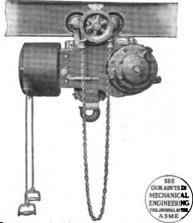


Especially useful where loads must be carried distances too long for the workmen to push them on the runway efficiently.



The sterling qualities of the Shepard Crane Trolley are secured by locating steel gearing and multiple discs within rigid cylindrical frames completely protected and completely protecting workmen.

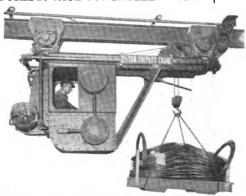
FORM 25 HOIST (with Geared Trollev:)



The use of this type of hoist permits hoist service in low headroom where sufficient lift could not be otherwise obtained.

SHEPARD ELECTRIC CRANE & HOIST COMPANY

FORM 24 CAGE CONTROLLED HOIST: FORM 2 X S HOIST:

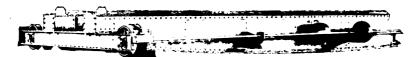


SHEPARD.

Where groups of small units in trays are to be handled, this type of hoist has decided advantages, particularly where there are curves in the I-beam runway. It can be supplied with two load hooks where long flexible loads are to be handled.

Light Capacity Hoist, for handling of loads just too heavy for one man.

443



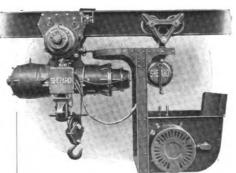
The Shepard idea of providing complete protection and automatic lubrication is carried throughout Shepard Cranes

ELECTRIC BACK GEARED WINCH:



A compact, weather-proof winch with running parts completely enclosed and protected from all atmospheric conditions. Its uses are mainfold in and about industrial plants.

FORM 25-1 D. C. MONORAIL HOIST



The use of heavy duty Monorail Hoists with the flexibility of handling arrangements which transfer switches permit, revolutionizes handling methods in many industries. Can be enclosed for outdoor service.

THE HERBERT MORRIS CRANE & HOIST COMPANY

(LIMITED)

MAIN OFFICE AND WORKS: NIAGARA FALLS, CANADA

Manufacturers of Overhead Traveling Cranes, Jib Cranes, Overhead Runways, Chain-Blocks and Accessories

MORRIS CHAIN-BLOCKS:





Whatever your handling problem may be, there is a Morris hand-hoist to handle the situation. Made in Worm-Gear, Spur-Gear, Triple-Gear, Differential and I-Beam Traveling types, the Worm-Gear type is also available with a gravity-lowering attachment when desired. Will take a load of from 1/26th long ton to 60 long tons, depending on the type selected and the service required. Their construction convinces the most critical and careful that they are safe and durable Each hoist is tested before leaving the plant with a load 50% in excess of its rated capacity.

Your Chain-Block will be shipped the same day your order arrives.

MORRIS HAND-OPERATED CRANES:



Modern business now recognizes from experience that "manufactured" equipment is far superior to "built" equipment. Morris production methods of manufacturing cranes assure you a relatively cheap crane of the best materials—durable and

safe—and where parts fail, due to natural wear, they come from our stock-room—not a "make-shift" from the local blacksmith.

Made in the Overhead Traveling, Gantry and Jib types. There are 54 variations in stock from 2 to 30 tons and up to 50-foot span. Other capacities or spans made up almost as quickly

As with all Morris products, each crane

must undergo strict inspection of materials and workmanship and stand an operating test load 50% in excess of rating.

ELECTRIC CRANES and other electrically operated equipment are similarly manufactured in quantities for stock. This space is too limited to permit of even touching on the many attractive features of Morris power-operated lifting and moving machinery.



OTHER MORRIS PRODUCTS:

Morris Belt-Driven Friction Hoist for small loads. Controlled by one handle and brake is automatic

and brake is automatic.

Telescopic Ash-Hoists for the convenient removal of material from basements and pits. 6 to 23 foot lifts.

Morris Spur Gear Chain Winch, made of plate-steel frame, cut-gears and standard Morris workmanship.

We also make portable tripods and tetrapods for hoists, all kinds of slings, chains and hooks.

Send for Bulletins and Catalogues.



PHILADELPHIA TRAMRAIL COMPANY

FRONT STREET AND INDIANA AVE., PHILADELPHIA, PA.

Manufacturers and Designers of Overhead Trolley Systems, Switches, Trolleys and all Kinds of Overhead Trolley Equipment



Overhead Trolley System in Grinding Room

OVERHEAD TROLLEY SYSTEMS:

Estimates furnished for overhead trolley systems for conveying all kinds of material for:

Abattoirs
Canning Factories
Cold Storage Rooms
Factories

Foundries

Markets
Mills
Packing Houses
Printing Press Rooms
Smoke Houses
Ware Houses

Machine Shops

Etc.

Send for our Bulletin No. 6-A.

GILLIS & GEOGHEGAN

Established 1866

543 West Broadway NEW YORK

SHERBROOKE, OURBRC. CANADA

Agencies in Principal Cities throughout the World

Manufacturers of the G & G Telescopic Hoist (patented) and G & G Sidewalk Doors with Spring Guard Gates; G & G Sidewalk Door Opening and Closing Device; G & G Patented Swing Bail Cans

Gillis & Geoghegan Hoists Gillis & Geoghegan Hoists are made in various standard models—telescopic and non-telescopic—manually and electrically operated. Also built to order. G & G Hoists are designed for the simple, safe, efficient and economical raising and lowering of loads at Industrial Plants—such as Bags, Bales, Barrels, Boxes, Cans, Carboys, Ice, parts of Machinery, other loads within their scope.

G & G Hoists are also designed for the removal of Ashes, Rubbish, etc., from Office Buildings, Hotels, Apartment Houses, Schools, Theatres,

MODEL E, TELESCOPIC HOIST operates electrically and is fitted with graphite-filled oil-less

bronze bearings. That part of Hoist shown telescopes below grade when not in use. Motor 11/2 h. p., totally enclosed (series wound for direct current. squirrel cage for alternating current), with brake, auto-matic upper limit and single speed controller. Hoist raises load of 500 lbs. at speed of 60 ft. per



446

Model E, Hoist, Electrically Op-erated, Installed in a Machine Shop

MODEL B, TELESCOPIC HOIST with Overhead Crane, operates manually. That part of Hoist



Model B, Telescopic Hoist, Manually Oper-ated, Installed in an In-dustrial Plant

shown telescopes below grade when not in use. Built to raise load of 300 lbs., at speed of 30 ft. per minute but its maximum capacity can be increased—by guy rods-to 500 lbs. For ash removal operator can raise load from cellar to position 6 or 7 feet above grade and empty cans to directly into wagon or truck without rehandling at grade level.



Hospitals, Churches, Residences, Railroad, Buildings, Institutions, etc.

G & G Hoists can be installed in old or new buildings on any floor or in boiler room where there is an opening preferabl 4 ft. square.

The G & G Hoist is compact, very easy to erect, no pity is required, and blue prints are furnished showing erection in detail. All parts are painted one coat except machined parts, which are coated with grease. Every G & G Hoist is subject to working test before shipment.

MODEL D, NON-TELESCOPIC HOIST with Overhead Crane, operates electrically. That part of Hoist shown

telescopes below grade when not in use. Electrical equipment same as Model E. Hoist raises load of 300 lbs. at speed of 60 ft. per minute-For ash removal operator can raise load from cellar to position 6 or 7 feet above grade and empty cans directly into wagon or truck without rehandling at grade level.



Model D, Non-Tele-scopic Hoist, Electrical-ly Operated, Installed ly Operated, Installed in an Industrial Plant

MODEL A, TELESCOPIC HOIST, operates manually and raises load of 500 lbs. At all times,

whether load is being raised or lowered, it is under perfect con-trol. A single move-ment of brake lever shifts gears and ap-plies brake, so that load is lowered with no movement of hoist-ing handle. That ing handle. That part of hoist shown telescopes below grade when not in use.

The G & G Telescopic Hoist was investigated and approved March 24, 1915, and June 10, 1920, by Investigating Committee of Architect and Engineering ing Committee of Architects and Engineers. For prices and further descrip-tion send for our complete catalog.



Model A, Telescopic Hoist, Manually Oper-ated, Installed in an In-Telescopic dustrial Plant.

SEDGWICK MACHINE WORKS

146 West 15th St., NEW YORK, N. Y.

TELEPHONE: WATKINS 9416

FACTORY: POUGHEEPSIE, N. Y.

PRODUCTS:

Hand Power Dumbwaiters, Elevators and Gravity Lifts of all types for every condition where economical, vertical conveying is required.

ADVANTAGES:

Our hand power conveying equipment is the most efficient for a wide variety of uses as well as being the least expensive to install and maintain. Sedgwick Machine Works have specialized for more than twenty-five years in the hand power field with the result that Sedgwick outfits are superior in design, material and workmanship. Vertical transportation of materials upwards in large quantities usually demands power, but downward it is frequently more profitably accomplished by Sedgwick dumbwaiters, hand power elevators, or gravity lifts, depending on conditions.

USES:

It is safe to say that most manufacturing establishments occupying buildings of more than one story can profitably install one or more Sedgwick Hand Power Elevators, Dumbwaiters, or Gravity Lifts, frequently a large number. Our equipment is giving satisfactory service in the following lines of industry:

Cracker Bakeries, Sugar Refineries, Dyestuff Works, Hat Factories, Phonograph Factories, Silk Mills, Chemical Works, Powder Mills, Paper Mills, Creameries, Crematories, Soap Factories, Printing Plants, Varnish Manufactories, Ink Manufactories, Rubber Goods Manufactories, Clothing Factories, Shoe Factories, Gas Plants, Pharmaceutical Factories, Oil Refineries, etc.

We list a few of the users:

American Sugar Refining Co.
Pratt & Lambert Varnish Co.
American Bank Note Co.
War Dept., U. S. Government.
American Druggists' Syndicate.
Packard Motor Car Co.
N. Y. Edison Co.
Consolidated Gas Co.
Goodrich Tire Co.
American Car & Foundry Co.
Goodyear Tire & Rubber Co.
Penn R. R.
Eastman Kodak Co.
Winchester Repeating Arms Co.
American Tobacco Co.

The National Biscuit Co.

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CATALOGS AND DRAWINGS:

Our catalog illustrates many types and we have hundreds of drawings showing special outfits for special conditions and requirements. New drawings will be made to meet new conditions.

SPECIAL SERVICE TO THE CHEM-ICAL INDUSTRIES:

If you will consult us as to your problems no matter how difficult, our Service Department will give them careful study and make recommendations. Only in case a Sedgwick outfit will give you better results than anything else will a Sedgwick outfit be recommended.

DELIVERIES:

Catalog sizes are carried in stock for immediate shipment.

Special outfits can be shipped a few days after receipt of order.



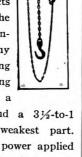
FORD CHAIN BLOCK CO.

SECOND AND DIAMOND STS., PHILADELPHIA, PA.

Manufacturers of the Ford Tribloc Chain Hoist, Screw Gear Hoists. Differential Hoists and Plain and Geared Trolleys

THE FORD TRIBLOC CHAIN HOIST:

The Ford Tribloc Chain Hoist is built in sizes and capacities from one-half ton up. It is equipped with the Ford Patented Loop Hand-Chain Guide which protects the working parts, keeps the chain from gagging, and enables you to operate at any angle. It has steel working parts, planetary gearing (which is enclosed in a dust-proof steel case), and a 31/2-to-1



factor of safety in its weakest part. 448 Eighty per cent of the power applied to the hand-chain of the Tribloc is converted into lifting energy.

ROLLER BEARING STEEL PLATE TROLLEYS:

We carry in stock, ready for immediate shipment, a line of Roller Bearing Steel Plate I-Beam Trolleys in all sizes, and in both the plain and geared types. Trolleys can be widened to suit larger than standard beams.

SCREW HOISTS:

(Duplex Type)

For work where the highest speed and efficiency are not required, we can furnish the Ford Duplex Type Worm Gear Hoist. This type of hoist is frequently preferred for portable use, as it is lighter in weight and at the same time powerful and durable.



DIFFERENTIAL HOISTS:

This is the simplest of all chain hoists, and where a hoist is required but occasionally and high efficiency and speed are not essential, it serves the purpose admirably. The Ford Differential Hoist is made with exceeding care and of the best material obtainable.



SEE OURADVIS IN MECHANICAL ENGINEERING

Send for a copy of our catalogue. It gives prices and goes into details.

PRICE LIST-TRIBLOC CHAIN HOISTS

Capacity in Tons	Price Complete	Regular Hoist in Feet	Extra Hoist Price per Foot	Net Weight in Pounds	Feet of Chain Handled to Lift Load One Foot
1/2	\$70.00	8	\$1.80	53	21
1	90.00	8	1.90	80	31
11/2	120.00	8	2.00	124	35
2	140.00	9	2.10	188	42
3	180.00	10	3.00	200	
4	220.00	10	3.20	290	69 84
5	280.00	12	4.30	380	126
6	330.00	12	4.30	390	126
8	400.00	12	5.40	470	168
10	480.00	12	6.50	570	210
12	600.00	12	8.60	800	126*
16	720.00	12	10.80	1000	168*
20	850.00	12	13.00	1375	210*
32 } 40 }	Prices and f	ull particula	rs upon request.	*For Each I	

MACWHYTE COMPANY

FORMERLY

MACOMBER & WHYTE ROPE CO.

Home Office and Works

KENOSHA, WISCONSIN

BRANCHES AT

CHICAGO

PORTLAND

BIRMINGHAM, ALA.

PITTSBURGH

Makers of Wire Rope of Every Description



WIRE ROPE:

"Monarch Whyte Strand" is made from wire having a tensile strength of from 220,000 to 280,000 pounds per square inch—it is superior to any other wire rope made—it is uniform and dependable—the strongest, toughest and most durable rope obtainable—this is the best—but we make all grades—and all constructions—some are listed below.

STANDARD HOISTING ROPE 6 Strands of 19 Wires Each—I Hemp Center

Dia, of Rope	Weight per Foot, Lbs.	Monarch Whyte Strand		Plough Steel		Crucible Steel	
		L. P	B. S.	L. P.	B. S.	L. P.	B. S.
1/4	.10	13	3 5	12	3	9	2
3/8	22	141/2	6 7	1234	6	914	5 8
1/2	39	17	12	14	10	11	8
53	62	221/2	19	19	16	14	12
	89	31	26	26	23	19	17
52	1.20	39	35	34	29	24	23
1	1 58	50	45	43	29 38	31	30
11/8	2.0	62	56	54	47	38	38
1.14	2.5	75	69	65	58	46	47
136	3	90	84	79	72	56	56
116	3.5	1 10	98	93	82	66	64
156	4.15	1 30	110	1 08	94	77	72
11/2	4.85	1 60	133	1 30	112	90	85
174	5.5	1 75	150	1 46	127	1 02	96
2	6.3	1 85	166	1 58	140	1 16	106

L. P.—List Price per Foot in Cents B. S.—Breaking Strength in Tons of 2000 lbs.

HAULAGE ROPE 6 Strands of 7 Wires Each—I Hemp Center

Dia. of Rope	Weight per Foot, Lbs.	Monarch Whyte Strand		Plough Steel		Crucible Steel	
		L. P.	B. S.	L. P. B. S.		L. P.	B. S.
ANAXAXXX XXXX	15 22 30 39 50 62 .89 1.20 1.58 2 0 2 5 3 3.5	834 11 14 13 14 17 20 14 28 14 37 48 58 72 88 1.05	6 14 7 12 11 13 17 15 25 33 42 52 67 79 90	6 6% 9 111% 143% 173% 243% 32 41 51 62 76 90	4 ½ 6 7 10 12 16 23 31 38 47 60 72 82	4 ½ 5 ½ 6 ½ 8 10 12 17 22 ½ 29 36 43 51 60	314 414 514 714 10 13 1814 24 31 37 46 53 63

L. P.—List Price per Foot in Cents. B. S.—Breaking Strength in Tons_of_2000_lbs.



KILINDO-PATENT NON-ROTATING ROPE:

We are the patent owners and makers of this non-spinning non-twisting wire rope—particularly adaptable in all cases where the load hangs on the free end of a hoisting line—is more flexible than ordinary rope—has 200% greater wearing surface.

449

Dia, of Rope	Weight per Foot, Lbs	Monarch Whyte Strand		Plough Steel		Crucible Steel	
		L. P	B. S.	L. P	B. S.	L. P	B. S.
**************************************	253 455 675 93 1.7 2.2 2.3 3.5 5 7 8	8½ 10 12 14 21 25 34 39 49 62 75 1 12 1 27 1 85	6½ 12 14½ 19 26 35 45 56 69 84 98 133 166 210 263	734 9 11 13 18 23 30 36 43 55 64 92 1.07 1.40 1.75	51/4 10 12 151/4 23 29 38 47 58 72 82 112 1140 186 229	6 7½ 8 9 12 16 20 25 30 37 43 63 73 92 1 20	41, 83, 10, 121, 17), 23, 30, 38, 47, 56, 64, 85, 106, 133, 170,

In ordering wire rope if you are uncertain as to the proper grade or construction, write to us for recommendations as to ropes best suited to your needs.

We also make hardware, fittings and auxiliaries used with rope.

Catalogue "M"—strictly up to date sent on request.

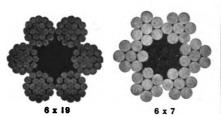
JOHN A. ROEBLING'S SONS COMPANY

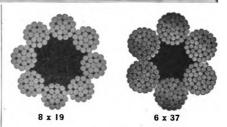
TRENTON, N. J.

Manufacturers of Wire Rope of All Kinds

We manufacture and keep in stock at our works in Trenton and at warehouses, agencies and branches in large cities wire rope, made from Iron, Cast Steel, Extra Strong Cast Steel, Plough Steel and Blue Center Steel.

We give below tables of strengths, etc., for the standard constructions of BLUE CENTER STEEL ROPE. This rope is also furnished with 6 strands of 37 wires each and with 8 strands of 19 wires each.





Roebling Blue Center Steel Rope is recommended as the best to use where extreme conditions tend to bring extraordinarily severe Stresses, and is particularly well adapted to resist abrasion.

The hemp center of this rope, where a hemp center is used, is colored blue to distinguish it from other grades.



BLUE CENTER STEEL HOISTING ROPE Composed of 6 Strands and a Hemp Center, 19 Wires to the Strand

Diam. of Proper Approx Approx. working drum or Trade Diameter strength in tons of weight per foot 450 circumf. load in sheave Number in inches in inches tons of 2000 lbs. in feet 2000 lbs. advised $2\frac{3}{4}$ $2\frac{1}{2}$ $2\frac{1}{4}$ 285/8 77/8 71/8 61/4 53/4 00 11.95 9.85 0 $\frac{262}{210}$ 53 10 8 6.30 12 42 988 21/2 13% 5.55 150 30 34 13/4 51/2 4.85 5 43/4 41/4 4 $\frac{4.15}{3.55}$ 61/2 110 22 98 20 51/2 5½ 6 3 2.45 84 69 31/2 $\frac{2}{1.58}$ 56 41/2 3 23/4 21/4 2 8 45 9 1.20 7 5.3 31/2 10 26.3 3 101/4 .62 19 3.8 21/2 101/2 .50 14.5 2.9 21/4 15/2/15/8-15/ 1034 .39 2.4 10a .30 $\frac{9.4}{6.75}$ 1.9 10b .22 1.35 10c .15 63

For H	aulages and Tr		CENTER STI		er, 7 Wires to th	e Strand
11	11/4	43/4	3.55	90 1	18	1 11
12	13/8	41/4	3	79	16	10
13	11/2	4	2.45	67	īš	ا مُمّ
14	11/8	31/2	2	52	ĩŏ	ا ۾
15	ī'	3´*	1.58	42	8.4	7
16	3/8	234	1.20	33	6.6	A
17	- ¾ I	21/4	.89	25	5.0	l š
18 I	- # l	216	.75	20	ă	معتما
19	62	2´°	.62	171/2	3.5	1 73
20	₩	134	.50	13	2.6	477
21	1/2	11/2	.39	11	2.2	31/4
22	7.	11/2	.30	73/	1.5	ا مرا
23	• • • · · · · · · · · · · · · · · · · ·	114	.22	612 l	î 9	234

A copy of our catalogue, giving information about other wire ropes and wire rope fittings, will be mailed an application.

WICKWIRE SPENCER STEEL CORP'N

WORCESTER, MASS., U. S. A.

Successors to

WICKWIRE STEEL COMPANY CLINTON WIRE CLOTH COMPANY MORGAN SPRING COMPANY

SPENCER WIRE COMPANY WRIGHT WIRE COMPANY NATIONAL MFG. COMPANY

NEW YORK

PHILADELPHIA

CHICAGO

BRANCH OFFICES TULSA, OKLAHOMA

SAN FRANCISCO

Manufacturers of Steel Wire, Wire Rope and Wire Products



Combining the highest quality of material with the greatest degree of skill in the manufacture of all our Wire Rope products.

Iron Ropes Crucible Cast Steel Ropes Plow Steel Ropes Galvanized Ropes Towing or Mooring Hawsers Hoisting Ropes, Regular Flexible and Extra Flexible Suspension Bridge Cables Ropes for Tramways, and Cable for Transporting Coal, Ore, etc. Ropes for Elevators, Power Transmission, Mining and Logging Standing and Running Rigging Derricks and Dredges Tiller Ropes All Kinds of Wire Rope, Fittings and Appliances

Ordinary forms and sizes always in stock. Special forms made to order promptly.

Swedish Iron, Crucible Cast Steel, Extra Strong Crucible Cast Steel, Plow Steel, Bronze.

Extra Flexible Ropes are made of eight strands around a hemp core, instead of the standard form of six strands. They are thoroughly efficient and very strong, and because of their much greater 451 flexibility can be used under many conditions in which the use of six-strand ropes would not be feasible. They are designed for running over comparatively small sheaves.

Recommended for derricks, dredges, electric cranes, coal-hoists, for logging purposes and for elevator cables.

In many cases where regular six-strand hoisting ropes have failed to work economically, our Extra Flexible Ropes have given perfect satisfaction in points of strength, length of service and economy.

Special flexible ropes are also made with 37 wires to the strand.

Wherever more than ordinary flexibility in wire ropes is desired, or the use of small sheaves and pulleys is necessary, we heartily recommend our Extra Flexible Ropes, made of our special high-grade quality of crucible cast steel and plow steel, which are the very best materials possible to use in wire ropes.

NEWHALL CHAIN FORGE & IRON CO.

90 West St., NEW YORK

156 SECOND ST. SAN FRANCISCO 126 North 10th Street PHILADELPHIA

Manufacturers of Welded Chains of Every Description



"TRIDENT" LOADING CHAIN: "WARWICK" DREDGE CHAIN:

TRADE MARK



Reg. U. S. Pat. Off.

STEAM SHOVEL AND DREDGE CHAINS, ALL SIZES.

SLING CHAINS, ALL STYLES:

452

CHAINS FOR:

CARS

CRANES

Conveyors

DREDGES

ELEVATORS

Hoists

LOGGING

MARINE RAILWAYS

MILL TRUCKS

POCKET WHEELS

QUARRIES

RAFTING

Sprockets

STEAM SHOVELS

ETC.

OTHER PRODUCTS:

Drop Forgings

HAND FORGINGS

CHAIN HOISTS

CHOCKS

CLEATS

CLEVICES

COLD SHUTS

COMBINATION DRILL PRESS

GUY CLAMPS

Hooks

REPAIR LINKS

SHACKLES

SWIVELS

WIRE ROPE CLIPS

Write for Catalogue.

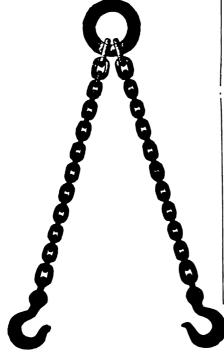


Fig. 355



EQUIPMENT CATALOGUED IN THIS DIVISION

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ALLOY FOUNDRY AND MACHINE CORPORATION

NEW ROCHELLE, N. Y.

Non-Ferrous Metal Castings: Government Bronze, Phosphor Bronze, Manganese Bronze, Acid Resisting Bronze, Red and Yellow Brass, Aluminum, Lead, Babbitt; Castings to Withstand High Stresses, Hydraulic Uses, Air and Gas Pressures

NON-FERROUS CASTINGS ARE EQUAL TO THE JOB:

A casting is just a casting-until some sudden stress takes place. Then you want to know how it will stand up. Will it fracture or will it hold? There must be no doubt as to its lasting qualities and adaptability to the work for which it is built. The surest way to know that your castings are safe, is to let us make them. You need not worry about castings we furnish-experience has taught us correct metal composition and proper methods of alloying the same.

Our Engineering Department is especially well qualified to advise and collaborate regarding design of pat-terns and recommendations of proper metal mixtures, which service is always freely and promptly at the command of clients.

The Location of Our Plant, being adjacent to the railroad freight yards, enables us to make deliveries with the utmost dispatch to all points in the United States.

One of Our Clients Writes:

"May we take this opportunity to say that you have taken care of our requirements for Brass and Bronze Castings in a manner that has been not only satisfactory but helpful, because of the promptness with which you have made up and delivered the goods to us. Quality has not been the least bit impaired by speed as is often the case. Out of all the castings you have made for us we have not found one imperfect before or after machining. For those who are looking for a quality product at a right price, delivered with a minimum delay, we can strongly recommend your product without hesitation."

They Are Simply Specified as Bushings,

On the machine you build they are supremely important factors in keeping the complete assembly in safe and efficient operation. No less care should be exercised in purchasing bushings than governs your choice of any other part of your product. Metal composition that is not right, or careless casting, might cause serious damage or ruin a costly assembly. When you purchase bushings from us, you get assurance of quality bushings-they are right in every way. They are made of a high grade bronze bearing metal, uniform in mixture and scientifically prepared.

We stock nearly all combinations of inside and outside diameters up to 4", in standard lengths of 12". Special sizes can be made up at short notice.

PHYSICAL CHARACTERISTICS of a few of our Alloys:

Government Bronze:

Tensile strength (min.) 32,000 lbs. per square

Tensile strength (min.) 2-,000 lbs. per square inch.
Yield point (min.) 16,000 lbs. per square inch.
Elongation in 2 inch. 15%.
Weight per cubic inch. 312 lb.
A strong bronze for severe working conditions where heavy pressures and high speeds prevail, for light gears, heavy bushings, etc.

Phosphor Bronze:

Tensile strength (min.) 40,000 lbs. per square

Nich. Yield point (min.) 20,000 lbs. per square inch. Elongation in 2 inch. 15%.
Weight per cubic inch .322 lb.
An excellent alloy where good anti-friction qualities are desired standing up exceedingly well under heavy loads and severe usage.

Manganese Bronze:

Tensile strength (min.) 60,000 lbs. per square

Yield point (min.) 30,000 lbs. per square inch.

Weight per cubic inch. 15%.
Weight per cubic inch. 291 lb.
A bronze of value where exceptionally great strength and toughness are required, such as in marine construction, propellers and fittings; resists corroding action of sea-water.

Red Brass:

Tensile strength (min.) 30,000 lbs. per square inch.

Wield point (min.) 15,000 lbs. per square inch. Elongation in 2 inch. 15%. Weight per cubic inch .317 lb.

A high grade composition mixture and an excellent bearing metal where speed and pressure are not excessive. Possesses good machining qualities.

Aluminum:

Tensile strength (min.) 18,000 lbs. per square inch

inch.
Yield point (min.) 10,000 lbs. per square inch.
Elongation in 2 inch. 5%.
Weight per cubic inch .104 lb.
A very light alloy possessing a high degree of strength, particularly adapted for uses where the ordinary bronze casting is objectionable on account of its weight.

"The Foundry That Delivers the Goods."

Digitized by Google

A. ALLAN & SON

HARRISON, NEW JERSEY

Inventors and Sole Manufacturers of Allan Red Metal and Allan Bearing Bronze

BEARING BRONZE:

The addition of lead to bronze, where same is accomplished by a process that will assure the casting of an alloy of uniform physical structure, a bearing bronze is produced that will have exceptional wearing and anti-friction qualities.

Allan Bearing Bronze is our lead-coppertin alloy, made of the proper proportions of virgin metals, so alloyed as to assure

456 a uniform physical structure. An exceptionally high grade bronze for high speed and heavy duty service. The bronze that will cut cost and upkeep on your mill pinions.

ALLAN RED METAL:

This alloy is not, strictly speaking, a Babbitt metal, nor can it be classed as a bronze, it just fits in the intermediate field to do such work where white Babbitt metals will not give satisfaction, as they readily change their form with an increase of temperature and yet conditions in many cases are such that it is impossible to use a bronze. Allan Red Metal com-

bines the best qualities of the Babbitt and bronze alloys. It has the high antifriction qualities of the Babbitt class with the temperature-resisting qualities of the bronze class.

Where will you find a bronze or Babbitt alloy that will stand up to the following service?

As shaft packing on steam turbines as a substitute for carbon.

As piston rod packing for locomotive service where temperatures run up to 650° Fahr.

As a bearing face for steam pistons with 150 pounds pressure and 200° superheat.

Allan Red Metal for many years has been meeting these service conditions and also overcoming troublesome conditions in crank pin, crosshead and motor bearings where white Babbitt metals have proven inefficient for the service conditions,

A. ALLAN & SON

HARRISON, NEW JERSEY

Inventors and Sole Manufacturers of Allan Red Metal and Allan Bearing Bronze



TRADE MARE

For over a quarter of a century we have been manufacturing bearing alloys, Allan Red Metal and Allan Bearing Bronze, our lead-copper and lead-copper-tin bearing alloys. They are made by The Allan Process, invented by Andrew Allan, Sr., in 1876. This is the only process which makes possible the alloying of lead-copper and lead-copper-tin in any desired proportion and assures the production of castings of uniform physical structure.

Our new plant at Harrison, N. J., is the highest attainment in foundry construction and equipment and is under | the patterns at nominal cost.



TRADE MARK

able metallurgical and mechanical supervision.

457

No orders too large or too small for prompt attention.

Estimates gladly furnished from blue prints.

Alloys sold in ingots and castings.

On long runs we prefer to make the necessary patterns.

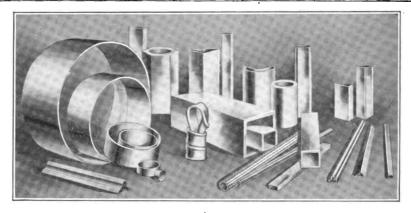
On short runs we prefer to work from customers' patterns or we can furnish

AMERICAN BRASS COMPANY

WATERBURY, CONNECTICUT, U. S. A.

MILLS AND FACTORIES

Ansonia Branch, Ansonia, Conn. Benedict & Burnham Branch, Waterbury, Conn. Buffalo Branch, Buffalo, N. Y. Coe Brass Branch, Torrington, Conn. Kenosha Branch, Kenosha, Wis. Waterbury Brass Branch, Waterbury, Conn.



BRASS AND COPPER TUBES: For Every Engineering Requirement

458

Admiralty and other special grades of Condenser Tubes.

Ferrule Tubes, Heater Tubes, Pump Tubes.

Brass and Copper Locomotive Tubes.

Tobin Bronze and Phosphor Bronze
Tubes for Bearings.

Brass and Copper Tubes in Iron Pipe and Plumbers' sizes.

HIGH TENSILE STRENGTH RODS AND BARS:

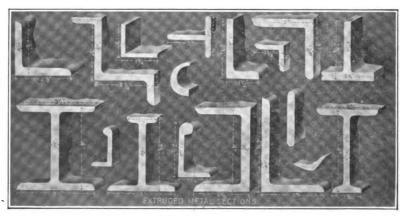
Adaptable for a Great Variety of Engineering Purposes

Tobin Bronze, remarkable for its Toughness and Resistance to Corrosion.

Free Cutting Rods, Naval Brass and Phosphor Bronze Rods.

Extruded Irregular Shaped Bars, Heavy Angles, Channels and Mouldings made from forgeable alloys of both Brass and Bronze.

Turbine Blading and Calking Materials.



CATALOGUE AND PRICES SENT UPON REQUEST

AMERICAN MANGANESE BRONZE COMPANY

GENERAL OFFICES AND WORKS

HOLMESBURG, PHILADELPHIA, PA.

"High Grade Bronzes for Engineering Purposes"

INTRODUCTORY:

We are prepared to quote prices and deliveries on any of the following commercial Bronzes in the following forms:

CASTINGS—INGOTS—FORGINGS
—RODS—ROLLS.

SPARE'S MANGANESE BRONZE:

shows a uniform even grain and is tough and ductile. It has the equivalent tensile strength of medium carbon steel. It is non-corrosive even in sea water and acid mine waters. Intricate castings can be poured from this metal.

HY-TEN-SL BRONZE:

is the strongest of all bronzes; being about equal to nickel steel. It is a homogeneous alloy of close, even texture and can readily be cast into difficult shapes. It can be forged rolled and extruded. It is non-corrosive.

HY-TEN-SL GEAR BRONZE:

is very close grained and exceptionally strong and tough. It has good antifrictional and free machining qualities. It is an excellent metal for use in Worm Gear Drives for Auto Trucks, etc.

NAVAL BRONZE:

is a tough ductile alloy very much softer than Manganese Bronze and showing a lower tensile strength and yield point and has a coarser grain.

EQUIPMENT AND FACILITIES:

Our large melting capacity and up-todate handling equipment enables us to take care of the largest castings desired.

459

TESTING FACILITIES:

We have an up-to-date testing laboratory under the constant supervision of a chemist.

Physical tests are conducted on the raw material and on every heat; thereby insuring the customer of the very best metal.

CATALOG AND LITERATURE:

We issue a complete catalog, as well as special bulletins on MARINE PRO-PELLERS; INGOTS, etc.

Any of the above may be had for the writing.

LUMEN BEARING COMPANY

(Established in August 1901)

BUFFALO, N. Y.

THE LUMEN BEARING COMPANY

(Building ready about May 1, 1920)

YOUNGSTOWN, OHIO

Brass Founders



NON-FERROUS ALLOYS scientifically controlled under laboratory supervision.

Makers of Machinebronze. Made in solid and cored bars in 12" lengths from 1/2" to 41/2" outside diameter, inclusive, by eighths. You can get Machinebronze from stock at your dealer. Don't wait the convenience of some foundry.

Machinebronze is guaranteed free from melting and moulding defects.

Lumen Bronze together with the 19 other brass and bronze alloys are in regular production in the Lumen way.

Ask for a copy of booklet describing them.

Babbitt Metals made and stocked in nine different compositions.

Solders to cover practically all engineering requirements made and carried in stock—8 grades.

We are manufacturers and founders of Brass Castings, Bronze Castings, Red Brass Ingots, Manganese Bronze Ingots.

Consult our engineering department about your bearing problems.

"The Right Bronze Means Economy."

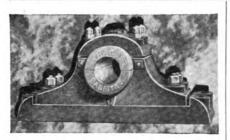
UNITED AMERICAN METALS CORP'N

Syracuse Smelting Works Subsidiary

DIAMOND STREET AND MESEROLE AVE., BROOKLYN, N. Y.

Branches in Principal Cities

Manufacturers of Babbitt Metals, Solders, Phosphor Tin, Phosphor Copper Dealers in Tin, Lead, Antimony, Copper, Nickel, Spelter Bismuth, Aluminum



GOVERNMENT GENUINE BABBITT:

For main engine bearings, crank-pins, connecting rods, centrifugals, eccentries, motors, etc. Highest grade of genuine babbitt. Brinell Hardness, 28.3 at 70 degrees F. Low coefficient of friction. Alloyed by the Stanley Process, assuring perfect amalgamation of elements.



AMERICAN MARINE GENUINE:

A babbitt of exceptional strength and durability. Expecially constructed to withstand severe impact, shocks, great pressure. Best babbitt for crushers, pulp grinders, lumber-gangs, sugarmills, A. C. motors, etc.



MASTER (Copper hardened) BABBITT:



A babbitt of great strength. Brinell Hardness about 27 at 70 degrees F. Does not shrink and therefore especially adapted for large bearings. Recommended for scored arbors because of its plasticity. For all high speeds and heavy pressures, except in such extreme cases where Government Genuine or American Marine Genuine is essential.



MANGANESE ANTIFRICTION:

Here is a babbitt that makes a solid, dense bearing, capable of standing up under hard wear. Flows like quicksilver. Retains its original purity when melted because of a coat which it makes for itself to ward off oxygen. Self-lubricating. For woodworking machinery, cotton-gins, sugar mills, saw-mills, paper-mills, dredgers, threshers, steam-shovels, etc.



SOLDERS, BARS, RIBBONS, DROPS:

Standard Bar 13½ inches long, weight about 1½ lbs. Boston Bar 15¾ inches long, weight about 1½ lbs. Philadelphia Bar 11¾ inches long, weight about 1½ lbs.

Capping Bar 14 inches long, weight about ¼ lb. Ribbon Solder in 15 inch lengths, ¼ inch wide, packed 5 lbs. to a box. Better than wire. Aluminum Solder in ribbons ¼ inch wide, 15 inches long. Also in capping bars.



PHOSPHOR TIN (Stanley Process Grade):

For delicate ornamental work, this flux is absolutely essential. Used by the largest foundries in America.

PHOSPHOR COPPER: (Stanley Process):

Both 15% and 10% grades. Makes the castings dense and workable. Drives out impurities. Use it when working with scrap metals.

FOR GALVANIZERS:

Stanbrite, the galvanizing flux thins the bath and keeps it clean. Brings out the spangle. Saves spelter.

OTHER PRODUCTS:

Sheet white metals, lead washers, brazing spelter.

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ALUMINUM COMPANY OF AMERICA

PITTSBURGH, PA.

BRANCH OFFICES

ALBANY
BALTIMORE
BOSTON
CHICAGO
CINCINNATI
CLEVELAND
DALLAS

DETROIT
INDIANAPOLIS
KANSAS CITY
MINNEAPOLIS
NEWARK
NEW HAVEN
NEW YORK

PHILADELPHIA
PITTSBURGH
ROCHESTER
SAN FRANCISCO
ST. LOUIS
WASHINGTON

CANADA, Northern Aluminum Co., Ltd., Toronto ENGLAND, Northern Aluminium Co., Ltd., London LATIN AMERICA, Aluminum Company of South America

ALUMINUM:

Ingot

Casting Alloys

Sheet

Foil

Rod

Wire

Tubing

Mouldings

Fittings

462

Electrical Conductors

Bronze Powder

Lithograph Plates

FABRICATED ALUMINUM:

Automobile Hoods

Fenders

Stampings

Tanks

Pans

Coils



Pipe Lines and Miscellaneous Apparatus for Chemical, Fruit Juice and other Manufacturers.

ELECTRICAL CONDUCTORS:

The use of Aluminum for electrical conductors is rapidly increasing. Its properties make its use desirable in electrical construction and it is now being successfully used for:

High Tension Transmission Wire

Railway Feeders

Bus-Bars, etc.

Aluminum cable with steel reinforcement is now extensively employed for High Tension Transmission Lines.

LITOT SOLDERS AND FLUX:

LITERATURE:

Descriptive matter, containing valuable information for the user of Aluminum in any of its various forms, will gladly be sent to those interested.

THE H. A. WILSON COMPANY

97 CHESTNUT STREET, NEWARK, N. J.

Refiners and Workers of Platinum, Gold, Silver and Other Precious Metals Manufacturers of Platinum and Silver Welded Contact Points, Sheet and Wire Manufacturers of WILCO Thermostatic Metal



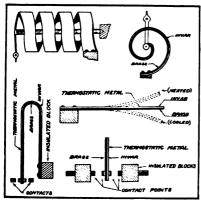
WILCO THERMOSTATIC METAL:

Wilco Thermostatic Metal is a temperature sensitive product made by permanently welding throughout their lengths two strips of metal having widely different coefficients of expansion. This union is mechanically perfect and will not fail under the most violent abuse, such as bending, punching or stripping. The application of heat will not cause the metals to separate up to the melting point of the lower melting point metal.

It can positively be relied upon to give absolute and uniform performance which must be considered in quantity production. When once incorporated into a design and not abused or mistreated, it becomes an unchangeable, permanent, and trustworthy fixture which will perform its functions indefinitely.

Thermostatic Metal is used with great success in many ways for the control, protection, indication and compensation of temperature sensitive devices. A strip of Thermostatic Metal subjected to a temperature difference will produce a capacity to generate power, thereby performing useful work such as moving levers, links and other mechanical parts.

Depending on location of metal in various devices, it can be used as shown in the following various shapes.





PLATINUM. PLATINUM IRIDIUM AND SILVER PRODUCTS:

Contact Screws and Rivets-The platinum or platinum iridium face being welded to the steel screw and to the steel or nickel rivet, by our processes, we attain a mechanically perfect weld. Welded contact screws have a distinct advantage over a platinum rivet driven into a screw because the tedious assembly operation is eliminated and perfect concentricity of the platinum face and the screw is obtained. Welded contacts are standard with all large users and are the most economical way to employ platinum for contact purposes. contact purposes. Furthermore, not 463 being soldered, the platinum is retained in all its purity, its heat conductivity and high melting point remaining unimpaired.

Tipped Wires—Straight cylindrical pieces of nickel having a platinum or platinum iridium tip welded at one end.

Platinum Faced Telephone Contacts with copper or silver back. Mechanically and electrically the equivalent of solid platinum contacts and effecting a sub-stantial saving of platinum, by doing away with the wasteful practice of using a highly precious metal as a mechanical fastening.

Platinum Wire and Sheet:

Solid Silver Rivets in three regular grades (fine, sterling and coin) and one highly special grade of fineness, the latter practically C. P.

Contact Screws with Silver Tips, similar to platinum screws described above.

Full information regarding our products will be gladly given, as well as advice and co-operation in an engineering capacity.

AMERICAN VULCANIZED FIBRE CO.

Established 1873

WILMINGTON, DELAWARE

VUL-COT FIBRE:

(A higher development of vulcanized cotton fibre.)

"VUL-COT Fibre" is the trade name of an extra fine quality of vulcanized cotton fibre, manufactured by the first producers of this material in America—the holders of the original patents, and for many years the sole American manufacturers. An experience, covering nearly half a century, has enabled them to produce a quality of fibre that is pure in content and flawless in structure. Only pure raw material is used.

The manufacturing processes are carried out under skilled supervision. Each stage is accurately and scientifically controlled. All traces of chemicals are removed. A rigid system of analysis, testing and inspection ensures this.

If you would be certain that the fibre used in your plant or product is the best quality obtainable, be sure that **VUL-COT** Fibre is specified. It is sold in sheets, rods and tubes of all standard sizes, or finished parts machined to your specifications.



PHYSICAL PROPERTIES OF VUL-COT FIBRE

Tensile Strength	9,000-14,000 lbs. per sq. in.
Compressive Strength	32,000-37,000 lbs. per sq. in.
Resistance to Shearing	9,000-13,000 lbs. per sq. in.
Electrical Rupture	150–400 volts per .001 thickness
Specific Gravity	1.2-1.5

We maintain an Engineering Department to help you get the greatest good from the use of **VUL-COT** Fibre. Put your problem up to them. Samples, prices and the interesting booklet "The Material of a Million Uses" will be sent you promptly upon request.

THE CONTINENTAL FIBRE CO.

NEWARK, DELAWARE

NEW YORK OFFICE 233 Broadway SAN FRANCISCO OFFICE 525 Market Street

PITTSBURGH OFFICE 301 Fifth Ave.

CANADIAN OFFICE Cor. King and Yonge Streets TORONTO, ONTARIO, CANADA

CHICAGO OFFICE 332 S. Michigan Ave LOS ANGELES OFFICE 411 South Main Street

The principal products of this Company are Vulcanized Fibre, Conite, Bakelite-Dilecto and Continental-Bakelite. Although manufactured primarily as Insulating Materials, their exceptional physical qualities render them adaptable to a wide range of Mechanical Applications.

BAKELITE-DILECTO:

Bakelite-Dilecto is an insulating material made of paper laminations impregnated with liquid Bakelite pressed together and hardened. It is manufactured in the form of sheets, tubes and rods. There are two sizes of standard sheets, 30" x 40" and 37" x 37", which may be obtained in any thickness from 0.005" to 3". Tubes are made 36" long with inside diameters of not less than 18 and outside diameters of not more than 6" with any wall thickness 14" and over. Rods are made from 1/8" to 31/2" diameter.

While Bakelite-Dilecto is a laminated material the laminations are so thoroughly saturated with Bakelite that the resultant product is practically homogeneous. Its many remarkable qualities adapt it to a wide range of purely mechanical uses.

Bakelite-Dilecto may be easily sawed, filed, machined and drilled in any direction without splitting or cracking. It saws like bone and turns like a soft metal such as copper. It can be punched successfully up to 1/8" in thickness with a plain die. Drilling makes a clean, smooth hole which taps easily, leaving clean, sharp threads.

The resistance to heat of Bakelite-Dilecto is remarkable. It will withstand a dry heat of 200° F. continuously and 300°F. for short periods without softening, blistering, cracking or change of shape.

When tested for mechanical strength Bakelite-Dilecto behaves in a manner similar to cast iron. It has an average tensile strength of 10,000 lbs. per square

inch, and under compression will test 20,000 lbs. per square inch parallel to the laminations and 40,000 lbs. per square inch perpendicular to the laminations.

Special Shapes: Finished articles from Bakelite-Dilecto sheet or tube, completely machined to exact gauge, ready for assembling, will be furnished in ac-cordance with design. Quotations on finished or semi-finished articles together with samples of work done will be gladly submitted upon receipt of specifications. Inquiries for this class of work are solicited.

CONTINENTAL-BAKELITE:

Continental-Bakelite is a laminated material made of cotton duck impreg-nated with liquid Bakelite pressed and hardened. It is made by the same proc- 465 ess as Bakelite-Dilecto and may be obtained in the same sizes of sheets, rods, tubes and special shapes. It has the same physical and chemical properties but is somewhat weaker mechanically.

BAKELITE-DILECTO GRADE G:

Gear Stock: The most important property of Bakelite-Dilecto Grade G is its extreme toughness which makes it an ideal material for noiseless gears. When meshed with a steel gear it takes up the shock because of its low modulus of elasticity, making a smooth and quiet running gear. Being water-proof, it will not soften or lose its mechanical strength under any weather conditions. The oil absorption is practically zero.

A gear made of Bakelite-Dilecto Grade G will, under ordinary conditions, take the place of a cast iron gear of the same size and have about the same life. The teeth of such a gear need no shroud, are stronger than, and will outwear the teeth of any other non-metallic gear.

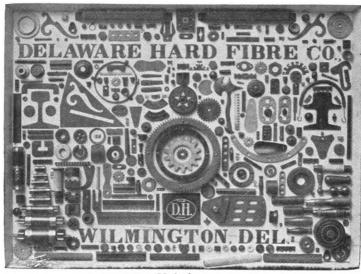
We are also makers of high grade Vulcanized Fibre and Conite, the best thin fibrous insulating material.



DELAWARE HARD FIBRE CO.

WILMINGTON, DEL.

NEW YORK OFFICE 50 Church St. CHICAGO OFFICE 564-70 W. Monroe St.



Special Shapes Made from Egyptian Fibre



D. H. EGYPTIAN FIBRE:

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Egyptian Fibre is a particular grade of fibre made under controlled conditions, and is the result of several years experimenting to produce a dense fibre of a uniform hardness.

Vulcanized fibre today is a recognized factor. D. H. Egyptian Fibre especially, because of being dense and uniform, it can be worked with less waste and increased production. It excells all ordinary fibre, due to the fact that it is the hardest and closest grained fibre made. It is also free from carbon and has the greatest wearing properties, is the most homogeneous and the best insulating.

D. H. Egyptian Fibre is the only fibre approved by the underwriters as an insulating material, and a large part of the big users of fibre specify it for insulating and mechanical purposes.

It contains no coloring matter or grit and works beautifully with machine tools. The color of

the product has been left to nature, for from experience it was found that excessive bleaching or the addition of pigments or dyes were at the expense of the quality.

D. H. Egyptian Fibre can be turned, drilled, machined, threaded and formed in dies better and faster than any other fibre. The Specific Gravity of D. H. Egyptian Fibre is from 15% to 20% greater than that of common fibre. On account of its extreme dielectric and tensile strength, D. H. Egyptian Fibre to-day enjoys the distinction of being the leading product of its kind.

Produced in Sheets, Rods, Tubes and Special Shapes.

Comparative tests showing superior qualities of Egyptian stock. For this test we selected 2 pieces of stock $\frac{7}{2}$ inch thick.

	Egyptian Fibre	Common Vulcanized Fibre
Specific Gravity	1.480	1.100
Absorption Water, 24 hrs	. 25%	70%
Hardness Scieroscope	50′	25
Shearing Strength, sq in.	13.000	9.000
Crushing Strength, sq. in.	43.000	33,000
Tensile Strength, sq. in.	13.000	8,000
Breakdown Voltage	50.000	12,500

Samples, prices and booklet on request.

DIAMOND STATE FIBRE COMPANY

BRIDGEPORT, PA.

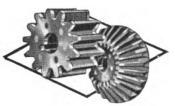
(Near Philadelphia)
OFFICES IN PRINCIPAL CITIES

Diamond-Fibre

A Remarkable Material

Efficient methods demand efficient materials. In the present period of reconstruction hard or vulcanized fibre has become a recognized factor. Dia-

mond fibre especially, because of its purity, its uniform quality, its extreme toughness and its high degree of shearing, compression and tensile strength, has won the confidence of leading engineers the world over. The result is that it is used



today in hundreds of places where brass, iron steel, hard rubber, glass, wood, mica, leather, etc., were once thought to be indispensable.

Diamond Fibre is a most efficient material, lending itself readily to the most



intricate machining process with but little wear or tear on edge tools. It is unaffected by grease or oil—has a high coefficient of friction—is a remarkable nonconductor of electricity—and will take practically every manufacturing process except moulding.

We produce Diamond Fibre in three basic forms—sheets, rods and tubes.



A Mark of Quality
A Sign of Service

We also make it in special forms. We are prepared to produce—and we make a specialty of—gears pinions, sprockets, gaskets bushings, washers, cleats, machining ferrules, and many other special shapes. Fully equipped machine

shops and a complete supply of stock in both our Bridgeport Pa., and Chicago, Ill., plants enable us to give prompt

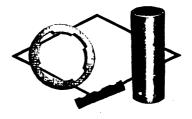


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service to patrons both East and West. We are at all times prepared to make prompt shipment of either raw stock or Diamond Fibre machined to specifications.

Diamond Fibre receptacles and trucks are well known in thousands of factories, mills and stores.

Diamond Insulation and Disfico In-



sulation are two high grade insulating papers. They possess extreme bending qualities and high dielectric strength.

We make Condensite Celeron, a new water-proof material of remarkable properties.

Send for Special Catalogues.

ATLAS CRUCIBLE STEEL COMPANY

GENERAL OFFICE AND WORKS: DUNKIRK, N. Y.

NEW YORK
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CHICAGO
ST. LOUIS

BRANCH SALES OFFICES
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CLEVELAND
BUFFALO
PITTSBURGH

Boston Minneapolis Toronto

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CLEVELAND

DETROIT

TRADE L-X X MARY
High Speed

PRODUCTS:

L-XX High Speed Steel.
Atlas Hot Die Steel.
Atlas Special Alloy.
Atlas Triple Extra Tool Steel.
Atlas Double Extra Tool Steel.
Atlas Extra Tool Steel.
Atlas Refined Tool Steel.
Deward Oil Hardening Steel.
E. B. Alloy.
ACSCO Special Steels.

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Licensed Manufacturers of Stainless Steel for Cutlery.

Ball Steel.
Magnet Steel.
High Speed Drill Rod.
Carbon Drill Rod.
Die Blocks and Discs.

Drop Forged High Speed Steel Forgings for Keyway Cutters, Milling Cutters and Special Tools.

L-XX HIGH SPEED STEEL:

To make one grade of high speed steel for general allround work, and make that grade the best, has been the aim of this community of steel makers, and L-XX High Speed is the masterful accomplishment.

This grade is especially recommended for turning, boring, planing, slotting and shaping tools. Twist drills and all forms of milling cutters, gear cutters, taps, reamers, special dies, and every purpose where any high speed steel can be used.

ATLAS HOT DIE STEEL:

For Hot Work

This is a "Red Hard" steel, resisting checking and holds its edge at temperatures, distinctive to simple carbon tool steel.

Useful for hot shear blades, hot punches, header and gripper dies; used in bolt and rivet making and all other hot work.

DEWARD OIL-HARDENING NON-SHRINKING TOOL STEEL:

A few of its uses are threading dies, chasers, taps, reamers, and all master tools. For gauges, plugs, etc. For stamping, punching and trimming dies.

ATLAS TRIPLE EXTRA TOOL STEEL:

Atlas XXX excels for cutting very hard metals at moderate speed. Although not a high speed steel, it is better for turning chilled cast iron and clean finishing cuts.

Makes excellent taps and reamers as well as tools for brass, bronze, aluminum, copper and chilled roll turning.

LITERATURE:

In addition to the above we make many other steels for various uses and purposes. All these steels, with their heat treatment, are interestingly described in our booklet, "Tool Steels," sent on request.

SERVICE:

We will be pleased to coöperate with you in the selection of the proper steel for your requirements. Write or call on us at our plant or our nearest branch office.

COLUMBIA STEEL & SHAFTING CO.

PITTSBURGH, PA.

NEW YORK BOSTON CHICAGO

SALES OFFICES DAYTON CLEVELAND PORTLAND

DETROIT PHILADELPHIA

Boston

CLEVELAND

DETROIT

WAREHOUSES **European Representatives**

COLUMBIA STEEL & ENGINEERING Co., LTD., 329 High Holborn, London, W. C. 1, England

Turned and Polished, and Cold Die Rolled Steel Shafting

Free Cutting Screw Steel

Cold Drawn Rounds, Squares, Hexagons, Flats and Special Shapes

Pump and Piston Rod Steel

And Special High Carbon and Alloy Steel

"COLUMBIA" TURNED AND POLISHED SHAFTING:

The superiority of turned shafting, for certain purposes, over the product of the cold drawing and cold rolling processes, is well known to most users. For transmission purposes in particular, it is most preferable, since by the turning process the structure of the steel is not changed and the shaft can be key-seated without the results produced by the same operation on a cold drawn or cold rolled product.

In this class of work we use the best quality of machinery steel obtainable for the purpose; the bars finished by our method are highly polished, absolutely true to gauge and accurately straightened; in short, the material is handled with all the care and minute attention to details affecting quality that characterizes our entire line of manufacture.

All "Columbia" Shafting in sizes 25 inches and larger is turned and polished (unless otherwise desired), and we are equipped to furnish smaller sizes so finished if ordered in sufficient quantities.

FREE CUTTING SCREW STOCK:



After many years of careful experiment, we have adopted and now use for this purpose a specially selected analysis steel, which, owing to its absolute free cutting and threading properties, has emphatically proven among the authoritative consuming trade to be admirably suited and best adapted for use at high speed, with maximum production of parts, in such as the automatic and hand screw machine and turret lathe operations.

Complete equipment with every facility to offer the very best products provides, and extreme care with close attention to the requirements of the trade insures such uniformity of structure and accuracy sufficient to firmly substantiate the claim of superiority (based on expression of trade opinion) in "Columbia" Free Cutting Screw Steel.

This material can be furnished in round. square or hexagon shape of almost any standard or special size required.

The illustrations shown above are reproduced from parts furnished us through the courtesy of some of our customers, these parts having been made from "Columbia" Free Cutting Screw Steel.



UNION DRAWN STEEL COMPANY

GENERAL OFFICES: BEAVER FALLS, PA.

WORKS: BEAVER FALLS, PA., and GARY, IND.



COLD DRAWN OR TURNED AND POLISHED:

470

SHAFTING

SCREW STEEL { Bessemer Open Hearth

ALLOY STEELS

Nickel—I% and 3% Nickel Chromium Chromium Chromium—Vanadium, Etc.

AXLES, PISTON RODS

SPECIAL SHAPES

SPECIAL CASE-HARDENING STEELS

Cold Finished Bessemer, Open Hearth,
Crucible and Electric Furnace Steels

Shafting: We use only the best quality of Soft Steel and are manufacturing under recent patents, covering machinery and appliances, by a process superior to anything known for producing great accuracy, a highly polished surface and the necessary straightness.

Piston and Pump Rods: Of special steels up to 70 or 60 feet long.

Screw Steels: For Automatic machine uses at high speeds.

Elevator Guides: Cold Drawn, Straight, with matched joints.

Special Shapes of Cold Drawn Steel made to meet your specifications; often more economical than castings and forgings where finished parts are needed.

Complete Warehouse Stocks Carried at

New York
DETROIT
CINCINNATI
PHILADELPHIA
CHICAGO

Branch Sales Offices at Boston; Buffalo and CLEVELAND, OHIO,



WHEELOCK, LOVEJOY & CO., INC.

128 Sidney St. CAMBRIDGE, MASS.

140 Nassau St. New York City

1800 Columbus Road CLEVELAND

5 No. LaSalle Street CHICAGO, ILL.

High Grade Steels for Every Purpose

HY-TEN ALLOY MACHINERY STEEL:

HY-TEN is the result of twenty years' metallurgical research and practical development, with the object in view of obtaining a steel which combines the strength and toughness of high grade chrome, nickel and vanadium steels, together with the free machining qualities so often lacking in these alloy steels.

This problem has now been completely solved by gradual development and elimination so that the HY-TEN Steel of today, which is a chrome-manganese alloy, possesses remarkable strength and toughness combined with excellent machining qualities.

HY-TEN is furnished regularly in ten different grades to meet varying requirements for strength, toughness and ma-chining conditions. There is a steel for case hardening, oil tempering, water quenching, etc., all of which can be fur-nished in hot rolled bars, cold drawn bars, forgings or discs, either in the natural condition, annealed or heat treated.

OTHER ALLOY STEELS:

We are prepared to furnish all of the standard grades of chrome-nickel, vanadium or other alloy steels for mill ship-

This includes nickel steel from 1 to 5% chrome-nickel, vanadium, chromevanadium, etc., which can be furnished in any carbon and with any combination of alloys specified.

All of the standard grades such as those specified by the S. A. E. are carried on hand at the mill in billets so that they can be furnished promptly in the size, shape and finish desired.

CUTLERY STEELS:

Cutlery Steels of all types are furnished; any shape desired may be obtained whether the material is required in sheets, strips, or bars. Information regarding our qualities of cutlery steels will be sent on request.

HIGH SPEED and CARBON TOOL STEELS:

Our High Speed and Carbon Tool | ment Requirements.

Steels are all manufactured from the purest of raw materials and in specially designed electric crucible furnaces.

This method of steel making produces the highest quality together with the greatest uniformity possible.

The adaptation of each grade of our Tool Steels to specific uses has been perfected through many years of experience with high grade steels, embodying careful and thorough study of the practical problems encountered in a manufacturing

We offer a specific grade of Tool Steel for every special purpose including High Speed Tool Holder Bits, various grades of Carbon Steels, Special Alloy Steels for Twist Drills, Steels for Ball Bearings, Magnets, Chisels and other special uses. All of these steels have been designed to satisfactorily perform a certain duty.

DRILL RODS:

We handle a complete line of polished drill rods, needle wire and steel spring wire, as well as lime drawn rods, in several different grades of steel, also high speed drill rod.

A large range of round and square sizes ready for prompt shipment is carried at the mill and at our warehouses, while mill service is available for flats, triangles, ovals, hexagons, octagons or other special shapes, drawn as accurately as these shapes can be milled.

Our drill rods and wire are all drawn to micrometer caliper and are guaranteed to be of the highest quality, most accurate in size and of finest finish. Rods are soft and uniformly annealed to permit of easy and satisfactory machining.

The temper best suited for your requirements can be furnished in any of our grades.

Send for Special Catalogues.

Mill and Warehouse Service.

Steels for Both Production and Equip-

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ACME DIE-CASTING CORPORATION

MAIN OFFICE AND PLANT

BUSH TERMINAL, No. 5, BROOKLYN, N. Y.

Aluminum-Zinc-Tin and Lead Alloys

BRANCH OFFICES

BOSTON, MASS.: 176 Federal St. Detroit, Mich.: 744 David Whitney Bldg. CHICAGO, ILL.: 175 Jackson Boulevard ROCHESTER, N. Y.: 242 Powers Building PHILADELPHIA: The Bourse Building

ACME-DIE

·CASTINGS ·

Those who have been closely in touch with the trend of finished cast parts in recent years have observed a marked development and higher accomplishment in the art of die-castings. A natural consequence of this evolution is the growing demand for castings of a higher standard than ever obtained in the past.

In making the Acme Die-Castings, we have held present-day requirements constantly in view and have created methods by which they are best fulfilled. Acme Die-Castings, therefore, are a distinctive modern product. As they are made with the most advanced ideas of construction in the art, they embody principles that experience has demonstrated to be the foundation of superior quality and the basis of quantity production.

Produced under these conditions, they are a product that not only meets the demands of the exacting technical expert, but insures a means which facilitates mechanical assembly.

Acme Die-Castings are made accurately in aluminum, zinc, tin and lead alloys, smoothly finished, and free from defects. As they are delivered ready to assemble, the ever increasing expense of labor and overhead entering into the cost of finishing parts is eliminated.

Submit us a sample of blue print of your parts, and we shall be pleased to submit you an estimate.

AUTOMOBILE PARTS:



The above illustration shows a Steering Wheel Spider, a Sector, a Throttle Lever, and a Spark Lever completely assembled. These castings are a few of the many automobile parts produced by the Acme process.

ELECTRICAL PARTS:



Parts for electrical devices which have been considered impossible to die-cast have been made successfully by the Acme process. Special parts requiring very thin walls, accurate depressions, projections, inserts and threads are diecast absolutely true to shape and detail, ready to assemble, polish or plate as they come from our plant.

ENGINEERING DEPARTMENT OF THE ACME DIE-CASTING CORPORATION:

Our Engineering Department is in charge of one of the most highly skilled die-casting engineers in the industry, who always will be at your service for designing and consultation.

Submit your problems and we will be more than pleased to co-operate with you.

THE ALEMITE DIE-CASTING & MFG. CO.

341-351 West Chicago Ave., CHICAGO, ILL.

Die Castings in Zinc, Lead, Tin, Alloys

ADVANTAGES:

Die Castings produced by the Alemite Process have the following distinctive advantages:

An increased output without an increased investment in machinery, floor space or personnel.

Dies being made of a specially alloyed steel, you are guaranteed interchangeable parts.

May be finished in any of the generally accepted commercial finishes.

They are guaranteed accurate; weigh one-fifth less than cast iron and onethird less than brass.

They cost less than machined, sand moulded castings, because they are produced ten to twenty times as fast.

Eliminates loss due to errors in machin-

They have a smooth, wear-resisting surface.

All departments of The Alemite Die-Casting & Mfg. Co. are equipped with latest types of special and automatic machinery, to guard against unnecessary delays in delivery.

GEARS:



By the Alemite Process, we are prepared to furnish to your specifications any of the following types of gears:

Spur-Bevel-Worm-Spiral or Internal in any pitch, shape or type of tooth.

APPLICATIONS:

Alemite Die Castings are successfully produced for and used in the following classes of apparatus:

Adding Machines Automotive Equipment Bearings Carburetors
Electrical Fittings
Electrical Instruments
Electric Pianos Handles Locomotive Headlights Musical Instruments

Phonographs
Scientific Instruments
Soda Fountain
Fixtures Telephones Throttle Levers Tractor Fittings Typewriters Venturi Tubes

THE ALEMITE DRILL STAND:

This device has many advantageous features. The handle makes the stand portable. It can be easily carried from one bench or machine to another. The drills are always accessible. A twist of the handle turns the stand until the desired drill is brought to view.



Beneath every drill number is given the decimal equivalent in inches of the drill size. Tap drill sizes are shown, designating the proper drill to use before tapping for every size from 2/16 to 1/2 inch. The drill sizes recommended are those proven by actual experience 473 to be the best suited for each tap size, so that just enough stock will remain to give a practical thread.

This stand is also a drill gauge. The holes are so accurate that only the proper drill will fit; yet the drill cannot bind. Usage will not wear these holes.

With this information on the workman's bench for ready reference, all time previously lost in referring to some grease-marked or blurred handbook, or loss from spoiled material caused by a wrong guess or reliance on poor memory, is eliminated.

Stands are finished in hard black enamel with polished handle.

Drill Stand No. 1—as illustrated, for drills from No. 1 to No. 60 (not including drills), \$3.00.

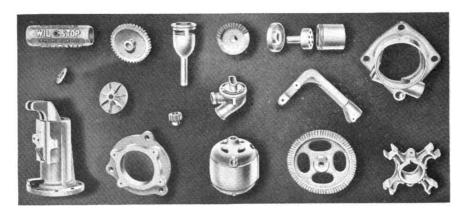
Drill Stand No. 2-like illustration, but for drills from 16 inch to 1/2 inch by 64ths (not including drills), \$3.00.



BARNHART BROTHERS & SPINDLER

MONROE AND THROOP STREETS. CHICAGO, ILLINOIS

Die Castings of Superior Alloys, noted for great tensile strength, hardness and lightness, Die Castings of Standard White Metal and Special White Metal Alloys



That same thoroughness is used in all 474 the processes that make Superior Die Castings that was effective in establishing the house of B. B. & S. as a great type foundry. The business was started more than a half a century ago, in 1868, and has made "Superior Copper-Mixed Type" known throughout the world as a product of exacting accuracy, cast of a metal that has never been equalled for good-printing and long-wearing qualities.

> B. B. & S. DIE CASTING ALLOYS are developed by experienced metallurgists, and these alloys are carefully kept up to precise standards. Die Making personnel and equipment are of the highest order. Casting Machines are of exclusive design, originated and manufactured solely in the B. B. & S. plant. Finishing facilities are efficient, and castings are inspected by men who have learned that it is better for them to do the rejecting than for the customer to do it.

Sales and Engineering Departments are organized for service-not for selfish solicitation and plain specifications. Let B. B. & S. help you determine if Superior

Die Castings can be used to make your product better and speed your production.

Physical Properties of "Tenso" Die Casting Alloy:

Tensile Strength45,000 lbs. p	er sq. in.
Brinell Hardness	79.6
Melting Point	810° F .
Weight, per cubic inch	0.210 lb.

Note: Tensile strength of cast iron is 20,000 to 25,000 pounds to the square inch.

"TENSO" DIE CASTINGS are three times stronger in tensile strength, 15% harder, and a third lighter than ordinary white metal die castings.

Unlike aluminum castings, Tenso Die Castings can be plated perfectly in nickel, copper, brass, silver, gold, etc., and can be japanned, the metal withstanding the necessary baking heat.

B. B. & S. also produce Die Castings of standard white metal and tin-base alloys, and can develop to order alloys to ENGINEERIN meet any special requirements.



DOEHLER DIE-CASTING CO.

MAIN OFFICE AND EASTERN PLANT: BROOKLYN, N. Y.

CENTRAL PLANT: TOLEDO, OHIO WESTERN PLANT: CHICAGO, ILL

Producers of Die Castings in Aluminum and White Metal Alloys, "Do-Di" Finished Brass Castings, and Babbitt Lined Bronze and Aluminum Back Bearings

Quality:

The prime requisites of die castings are accuracy, strength and uniformity. There must be no imperfections. Doehler Die Castings meet these requirements fully. Doehler engineering and manufacturing methods represent the highest development of the industry.

Service:

The Doehler Company is the world's largest manufacturer of die castings. Its plants are equipped and manned to give exceptional service. Orders for die castings in small or large quantities can be executed promptly.

Economy:

Doehler Die Castings are the least costly in the final reckoning. Their high quality and the absolute reliance that can be placed on them make them the most economical to purchase.

Evidence:

The Company will appreciate an opportunity of presenting figures from the experience of many, showing the savings that have been effected. The Company's



engineers stand ready to advise you regarding the possible economies in your own manufacturing proposition.

White Metal and Aluminum Die Castings:

The Company is prepared to design and manufacture die-cast parts of lead, zinc, tin or aluminum base alloy composition. The Company stands ready to warrant that die castings, whose design and composition are approved by its engineers, will give you full service satisfaction.

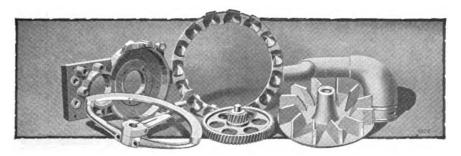
The Doehler standard of manufacture is a guarantee of a uniform product. Only virgin metals are employed in making Doehler alloys and their adherence to an absolute standard is guarded by careful checking at all stages. Doehler dies, die-casting machines and workmen are the best of their kind.

Our descriptive literature will be gladly sent to those interested.

"DO-DI" Finished Brass Castings:

The patented "Do-Di" process places at your disposal accurate finished brass castings. Smooth surface, sharp outlines, homogenous structure, cast holes or screw threads and quantity production to limit measurements make "Do-Di" Castings the means of effecting farreaching economies.

Let "DO-DI" Finished Brass Castings catalogue tell you the story and point out their wide adaptability.



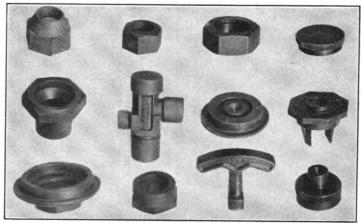
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475

THE NEW JERSEY BRASS CORP'N

MAIN OFFICE

GRAND CENTRAL PALACE, NEW YORK, N. Y. FACTORY GARFIELD, NEW JERSEY



DIE PRESSED PRODUCTS:

476 Brass
Bronze

Copper Nickel Silver

We specialize in the manufacture of DIE PRESSED PARTS that meet the exacting demands of efficient quantity production.

Our products are fabricated under the rigid supervision of experienced metallurgists and die-making experts, from the raw materials to the final operation, and are always uniform in analysis and free from internal and external structural imperfections.

DIE PRESSED PARTS made by our

process are of uniform accuracy and smooth finish, which reduces the cost of machining to a minimum, eliminates waste and speeds up production.

waste and speeds up production.

We maintain an Engineering Department to assist you in determining how parts made by our process can be advantageously substituted for any form of casting.

An organization comprising skilled specialists in every department, and a plant equipped with modern machinery enables us to render intelligent service and make prompt shipments.

Quotations upon request.



MOHEGAN TUBE CO.

SCOTT AVENUE AND MESEROLE STREETS BROOKLYN, NEW YORK, U. S. A.

Manufacturers of Steel Tubing

WELDED STEEL TUBING:

This Company specializes in the manufacture of welded steel tubing, 3% inch to 3-inch diameter round, and from 14 to 20 BWG. The weld produced by our special process is so thorough that the finished tubing is in every way as strong as seamless steel tubing of the corresponding gauge and diameter. Under its special welding process, the tube arrives in its finished form without the strains produced by other methods of manufacture.



Some of the Standard Grades and Shapes of Tubing Manufactured by Us

SHAPES:

Round, square, oval or special shapes furnished straight or bent. Can be bent, swaged, flattened, upset and drawn out without injury; the weld is thorough and will not become weakened.

COST:

We are, therefore, able to offer you a superior steel tubing at a lower cost than seamless.



Difficult Mechanical Operations and Tests Performed on Mohegan Tubing—Flattening, Crushing, Knurling, Swaging and Bending

USES:

Since Mohegan Steel Tube is formed from cold-rolled strip steel, in a single operation, its surface is clean and smooth. Many manufacturers of tire pumps have selected it for this reason. It is used for exhaust manifolds where severe treatment is received in forming. It is used for automobile, motorcycle and bicycle parts, for roller conveyors, for metal furniture and hundreds of other articles too numerous to be listed here. Mohegan Steel Tube is recommended for all purposes where a strong light steel form can be used. It is a structural material, however, and not intended for the conveyance of liquids.



A Few of the Odd and Special Shapes Which We Are Prepared to Manufacture to Order

OTHER TUBING:

We also manufacture "Lock-joint" steel tubing for beds, open and butted seam steel tubing in the same diameters and gauges as the welded. We can furnish seamless steel tubing in any size or gauge, and "Sherardized" (rust-proofed by zinc process) seamless steel tubing.

For beds, Mohegan Welded Steel Tube and Mohegan "Lock-joint" steel tube is in use everywhere.

Mohegan "Sherardized" Steel Tubing is used by most manufacturers of automobile inner tubes for tires as mandrels.

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THE AMERICAN FORGE & MACH. CO.

CANTON, OHIO

Manufacturer of Steel Forgings

PRODUCT:

Drop and Drawn Forgings; all sizes of Crane hooks, Bridle or Porter chains for heavy hoisting; links made from Chrome-Vanadium Steel with pins of the same material, all heat treated will give the most lasting chain material known; Tinning and galvanizing Rolls; Annealing box hooks; Gear blanks; Rider Blocks; Hot Mill Screws and other mill forgings.

FACILITIES:

Our equipment is one of the best and most modern in our field. Our Drop Forge Plant includes steam drop hammers from 1200 to 5000 pounds, to which may be added a well equipped Drawn Forge Plant where are located two Steam Hydraulic Forging Presses.

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Our machine shop is equipped with saws, lathes, boring mills, planers, shapers, etc., whose capacity is ample to take care of forgings weighing thousands of pounds.

Our heat-treating plant is one of the most modern in the country with regard to its equipment and is backed by experts in this art. This plant has been meeting the United States Government requirements as to heat treatment which is a paraphrase for excellent and accurate work.

QUALITY:

The materials used by us in our forgings are tried and tested results of laboratory experiments and our forging steel is guaranteed to us to be free from pipes, seams and laminations.



1800 Lb. Locomotive Driving Axle

HOT MILL SCREWS:

We have developed a Hot Mill screw that will last under the trying service to which they are subjected. The combination of metal and heat treatment we put in our screws makes them outlast several ordinary screws.



We are specializing in these better housing screws and boxes and are prepared to fill orders with dispatch. They save time and money by reducing the number of shut-downs incidental to replacements and also the cost of many new screws.

SERVICE:

We have been experimenting with and improving upon methods and processes of forging and heat-treating for years. All the valuable experience gained by our engineers and chemists reverts to our customers. Consult with our engineers concerning your forging propositions and let us solve your difficulties.

THE POLLAK STEEL COMPANY

GENERAL OFFICES CINCINNATI, O.

WORKS

GENERAL SALES OFFICES
EQUITABLE BLDG., NEW YORK CITY

CINCINNATI AND MARION, OHIO CHICAGO

Manufacturers of Heavy Forgings, Drop Forgings, Bar Mill Products

ORGANIZATION:

Three coördinated units. Originated in 1865. With fifty-five years of continuous service to users of steel products. Each unit made up of thoroughly experienced and competent engineers and supervisors to guarantee the most exacting interpretation of the most technical specifications.

PLANTS AND FACILITIES:

Three separate, completely equipped modern plants, for the forging and machining of heavy forgings of every description. Drop Forgings and the rolling of steel products within bar sizes.

POLLAK SPECIAL HEATTREATMENT:

By years of concentration and constant application, we have become recognized as one of the foremost in this art. Our Heat Treating Plant has been acclaimed by many as one of the most complete. Our products serve every line of industry.

HEAVY FORGINGS:

For steam and electric railways. Car & Locomotive Axles, Crank Pins, Side Rods, etc. Marine Forgings, Propeller Shafts, Sleeves, etc. Heavy Industrial Forgings such as Rolls, Shafts, Yokes, Engine, Pump and Motor Forgings.

SPECIFY POLLAK HOLLOW BORED AXLES AND SHAFTS.

DROP FORGINGS:

479

ENGINEERING

For automobiles, tractors, trucks, gas engines, etc. Crank shafts, cam shafts, gears, pinions, connecting rods, clamps and brackets. Also forge machine products of every description.

BAR MILL PRODUCTS:

Rounds, Squares, Flats and Bands, Angles, Channels, Special and Small Shapes. Concrete Re-enforcing Bars, Plain Rounds and Squares. Twisted Squares and Deformed Bars.

USE THE "POSCO" BAR, BAMBOO STEEL, AND TRIANGLE "P" DROP FORGINGS.

VULCAN STEAM FORGING CO.

247 RANO STREET, BUFFALO, N. Y.

Makers of High Grade Forgings

For twelve years we have been furnishing forgings to die makers, both jobber and manufacturer, and these the most successful and reputable in their respective lines. The results of our successful experience are tendered you in your requirements of crucible tool steel smooth forged Cutting and Draw Die Weldless Rings, Composite Dies and Punches, Circular Cutters, Shear Blades, and all other types of forgings used by die makers. These tool steels are straight carbon and alloyed, including a Non-Shrinking, Non-Warping type.

Where your machine or other part requires hardness, maximum of strength and resistance to fatigue our Alloy steels under recommended treatment will secure these results. Gears, Axles, Spindles, Reamer bodies, etc., quickly furnished.

Do you require light and medium weight smooth forged machinery steel Crankshafts, Spindles, Rolls, Levers, Cutterheads, Gear Blanks, Cam Shafts, Cams, Gauge Rings, Shafting, or other machine parts? Our quality of workmanship will add to the satisfaction you possess in your own product.

Have your requirements in Ball Race Ring forgings been supplied? We are responsible producers of these made either of tool steel or special chrome steel.

Your enquiries are earnestly solicited.









WORCESTER PRESSED STEEL CO.

Factory and Main Office
WORCESTER, MASS.
Light and Heavy Metal Stamping

New York Office Woolworth Bldg. Bridgeport Office 1646 Fairview Ave. CHICAGO OFFICE 15 N. Jefferson St. INDIANAPOLIS OFFICE 28 So. Meridian St. DETROIT OFFICE 611 Central Ave. SAN FRANCISCO OFFICE (stampings) Rialto Bldg.

HIGHEST QUALITY LIGHT AND HEAVY METAL STAMPING:

Deep Drawing Cold Forging

Cold Rolling
Pressing



Our entire organization and equipment, developed by 30 years' experience, are devoted exclusively to making special stamped parts for others from strip and sheet steel, brass, bronze, copper, aluminum, silver, monel metal and the new steel alloys. We make all of our own tools. We pickle, oil, shear and cold-roll our own steel.

SHEET METAL PARTS TO ORDER FOR:

Automobiles

Axle Boxes

Ball Bearings

Bicycles

Bowls

Brackets

Brake Drums

Calculators

Caps

Cases

Clutch Discs

Cream Separators

Cups

Dictographs

Discs

Electrical Fittings

Flanges

Guards

Handles

Hubs

Ice Skates

Lawn Mowers

Looms

Motorcycles

Phonographs

Pruners

Pulleys

Retainers

Roller Skates

Sheet Metal Specialties

Shims

Shock Absorbers

Stampings

Telautographs

Telephones

Textile Fittings

Typewriters

Vacuum Cleaners

Washers (Special)

Washing Machines

Wrenches

SEE OURABYTE IN MECHANICAL ENGINEERING THE ASSESSMENT OF THE A SM-B 481

We also have one of the most completely equipped COLD ROLLED STRIP STEEL MILLS in the East, having a capacity of 5000 tons per month and producing strip steel up to 12" in width and from .005" to .375" in thickness.

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Metal Working Machinery, Machine Tools and Accessories

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ATLAS PRESS COMPANY

2000 N. PITCHER ST., KALAMAZOO, MICH., U. S. A.

Manufacturers of Atlas Compound Mandrel Presses

EFFICIENT ARBOR PRESS EQUIPMENT:

ATLAS PRESSES are built in all sizes and types for driving mandrels, bending and straightening, broaching, embossing with dies, setting bushings, etc. In fact, all work requiring pressure up to 25 tons and centering capacity up to 38 inches may be done quicker and easier on our Compound Presses than by any other method.



No. 3 on Stand

Pinions are cut from forgings of Chrome Vanadium—Rams from specially treated Chrome Nickel. All parts designed to give highest degree of efficiency under all service conditions. Complete details upon request.

Carried in stock by leading machinery dealers everywhere.



No. 4 Press



No. 24 Press

485

E. W. BLISS COMPANY

MAIN OFFICE AND WORKS: BROOKLYN, N. Y., U. S. A.

Сніслоо

DETROIT

CLEVELAND

London

PARIS

BUFFALO

PITTSBURGH

CINCINNATI

St. Louis

PRESSES, DIES, SHEARS, DROP HAMMERS, DOUBLE SEAMERS, SPECIAL MACHINERY





1920

Tin and Enamel Ware Machinery
Metal Package Machinery
Automatic Tin Can Machinery
Electrical Parts Machinery
Automobile Parts Machinery
Drop Forging Machinery

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"BLISS" INCLINABLE - POWER PRESSES: 18 sizes, weighing from 500 to 8,000 lbs., either as "Fijwheel" or "Geared" Presses. Adapted for tin, sheet brass, sheet steel work, etc.



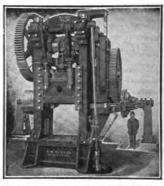
"STILES" AUTO-MATIC DROP.
H A M M E R S:
Built in 15 sizes.
Adapted for forging or stamping.
Hammers weigh from 100 to 3000 lbs.

"BLISS" DOUBLE SEAMERS (not illustrated):

Built in over 30 different types and sizes, weighing from 275 to 7,500 lbs. For double seaming the tops and bottoms on articles of square, round, oval and irregular shapes.

"STILES" PUNCHING PRESSES (see opposite page):

11 sizes, weighing from 550 to 13,000 lbs. Adapted for the manufacture of general hardware, electrical goods, etc.



"BLISS" TOGGLE DRAWING PRESSES:

Built in over 20 sizes, weighing from 5,600 to 165,000 lbs. For drawing shells from all kinds of sheet metal.



"BLISS" STRAIGHT-SIDE DOUBLE CRANK PRESSES:

Built in over 150 different types and sizes, weighing from 2,500 to 260,000 lbs. For heavy blanking, stamping and punching of large dimensions.

"BLISS" KNUCKLE JOINT EMBOSSING PRESSES (see opposite page):

Built in 12 sizes and various styles, weighing from 2,700 to 110,000 lbs. and capable of exerting pressures ranging from 30 to 1,500 tons.

"BLISS" AND "STILES" OVERHANGING DOUBLE-CRANK PRESSES (not illustrated):

Built in over 100 different types and sizes, weighing from 2,300 to 280,000 lbs. For heavy blanking, stamping and punching of large dimensions, etc.

Catalogue of any line of our michines sent on request.

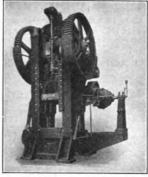


ENGINEERING

ASME

E. W. BLISS COMPANY







Cut Back Frame

Straight Side Press

Double Action Cam

Our Product Includes MACHINERY AND DIES for the Economical Manufacture of the Following Sheet Metal Goods:

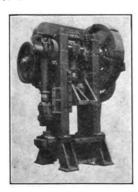
Agricultural Implements
Albums
Door Knobs
Aluminum Ware
Armature Disks and
Segments
Dust Pans
Door Knobs
Druggists' Tinware
Dust Pans Segments Automobile Parts Automobile Parts
Bicycle Parts
Bird Cages
Bottle Caps and Capsules Expanded Metal Laths
Brass Goods
Brittania Ware
Buckles
Burners
Burners
Furnit Cans
Furnit Cans
Furniture (Metal)
Gas Fixtures Burners
Butter Tins
Cash Registers
Cigarette Boxes Clocks Coal Hods Collapsible Tubes Contagnine Tudes
Cooking Utensils
Coins
Cornice Work
Cuspidors
Cuttery
Dental Instruments Dinner Pails

Electrical Goods Gas Fixtures Gas Ranges Gongs Gun Parts Hammers Hardware Harness Trimmings Hinges Horse Shoes Jewelry Kitchen Boilers Kitchen Utensils

Lamps Lanterns Lard Pails Match Boxes Meat Cans Medals Metallic Ceiling Metal Laths Metal Radiators Musical Instruments Oil Cans Oil Stoves Perforated Metal Paint Cans Paint Tubes Petroleum Cans Pick-eyes Pieced Tinware Plated Ware Playing Cards (Cutting)
Powder Kegs
Range Boilers Range Parts Reflectors Refrigerators

Roofing Rubber Cups Satchel Frames Speaking Tubes Silver Ware Sheet Steel Sinks Shingles (Metal) Shovels Spoons Sheet Steel Stoves Steel Barrels Thimbles Tin Boxes and Cans Tobacco Boxes Toys Trunk Trimmings Typewriters
Vapor Stoves
Varnish Cans
Vegetable Cans
Water Coolers
Water Pails Watches Wash Tubs Zinc Work

And Many Other Staple and Special Lines of Goods.



Trimming Press



"Stiles" Deep Throat



Knuckle Joint



487

THE LONG & ALLSTATTER CO.

AMERICAN PUNCH & SHEAR WORKS

Established 1856

Incorporated 1878

HAMILTON, OHIO, U. S. A.

Manufacturers of Vertical Punches and Shears (Single and Double Ended), Horizontal Punches, Multiple Punches, Splice Bar Punches and Shears, Gate or Guillotine Shears, Bar Iron Shears, Angle Iron Shears, Plate Splitting and Crosscutting Shears, Alligator Shears, Horizontal Bending and Forming Machines or "Bulldozers," Board Drop Hammers, Cushioned Helve Hammers, Spacing Tables, Etc.

VERTICAL PUNCHES AND SHEARS:

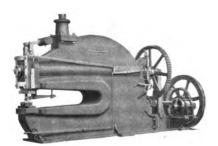


Fig. 1303-No. I Single Machine

A complete line of open throated, single and double ended machines, made in various sizes ranging in capacity from the smallest to the most powerful types, with throat depths varying from 5" up to 84". The form of the lower jaw on these machines can be modified so as to adapt them for punching structural shapes, etc. By changing tools these machines can be used either for punching or shearing.



Fig. 1369-No. 2 Double Machine

SHEARING MACHINES:

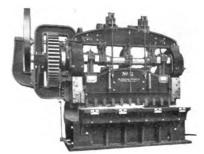


Fig. 1513-No. G Gate Shear

Varying in width between housings and depth of throat; and made in sizes to cut off and trim from $\frac{14}{3}$ " thick plates.



Fig. 874-No. B Bar Iron Shear

Made in different sizes, and designed for shearing flat and round bars, and angles.

These machines are also made in different sizes to cut from the smallest to the largest angles, cutting them off square or to a miter of 45 degrees.



or to a miter of Fig. 865—No. B Angle Iron 45 degrees. Shear on Turn-table

THE LONG & ALLSTATTER CO.

AMERICAN PUNCH & SHEAR WORKS

Established 1856

HAMILTON, OHIO, U. S. A.

Incorporated 1878

489

MULTIPLE PUNCHES:



Fig. 1406-No. C Multiple Punch

These machines are designed to punch a number of holes at a time in rows or groups and are made in various widths between housings. Hand or automatic feed spacing tables may be attached to machines of this kind when desired.

HORIZONTAL MACHINES:



Fig. 1443—No. I Horizontal Punch and Bender
These machines are designed to punch
or bend flanged work and structural
shapes, such as I-beams, channels, angles,
etc. Made single and double ended.

STRUCTURAL PUNCHES:

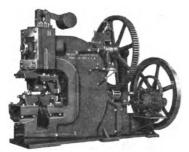


Fig. 1428—No. B I-Beam Punching and Coping Machine

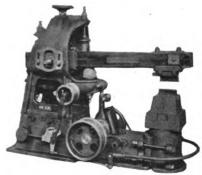
These machines are made with slot in the lower jaw, to punch and cope structural sections, such as I-beams, channels, angles, etc.

HAMMERS:



600-lb. Board Drop Hammer

Made in a variety of sizes to meet the requirements of modern drop forge, agricultural, stamping and numerous other trades. Write for Bulletin BDH-A.



60-lb. Cushioned Helve Hammer

Made in 25 to 100 lb. sizes. Adapted for all classes of work, from plain drawing out to difficult semi-drop forging work. Write for Bulletin RCH-1.

Let us know your requirements and we will be glad to specify the size and type of machine best suited for your work.

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NIAGARA MACHINE & TOOL WORKS

Established 1880

BUFFALO, N. Y., U. S. A.

Tools and Machines for Working Sheet Metals, Presses and Punches, Power Shears,
Tinsmiths' Tools, Forming Rolls, Etc.

Furnishing Tinsmiths, Sheet Iron Workers, and Sheet Metal Goods Manufacturers, the proper tools and equipment for efficient production, has been for forty years the exclusive work of this company. It offers machines for folding, bending, curving, crimping, beading, flanging, grooving, seaming, blanking, punching, perforating, forming, stamping. drawing, shearing and other operations in Sheet Metals; hand tools, hand operated, and high production machines.

Competent Engineers are at your service. Inquiries are solicited.

PRESSES:

490

Inclinable, Punching, Horning and Wiring, Arch, Straight Sided, Single



No. 615 E Press

Crank, Double Crank, Trimming, Toggle Drawing, Cam Drawing, Reducing, Screw, Foot, Drop, Bench and other types; built in sizes up to 75,000 lb. weight, for light or heavy sheet metal punching, cutting, blanking, bending, forming and drawing, also for trimming drop forgings.

SHEARS:

SQUARING Shears, foot operated, belt or motor driven; made in a full range of





lengths from 2 to 16 feet, for any thickness of material up to and including

three-eighths inch; with or without gap. Niagara Shears make straight, accurate cuts the full length of the Shear. The gap is necessary for shearing sheets longer than the machine.



No. 16 A Ring Shear

ROTARY Shears, hand operated, belt or motor driven; built in many sizes; for light gauge, up to one-half inch capacity; with various depths of throat; in both ordinary and ring shear, or internal circle types; with circle arm for cutting discs and rings, or arranged for straight slitting, irregular cutting, etc.

FORMING ROLLS:

Our Slip Roll Formers are made in diameter 1½" to 7" lengths up to 10 feet; capacity up to ¾"; for curving Sheet Metal, or forming to cylindrical shape;

6" x 120" Slip Roll



ordinary construction or with special features to suit requirements.

SHEET METAL WORKERS' TOOLS:

Folders, Brakes, Beaders, Crimpers, Flangers, Groovers, Double Seamers, Elbow Machines, Stakes, Snips, Bench Shears, Rivet Sets, Hand Tools, Roofers' Tools, Notcher's, Lever Shears and Lever Punches, all in great variety of size and type.

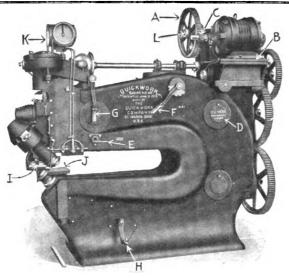
Complete catalog upon request.

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THE QUICKWORK COMPANY

ST. MARY'S, OHIO

Manufacturer of Plate and Sheet Metal Working Machinery



Patented June 3, 1913

491

"QUICKWORK"

ROTARY SHEARS:

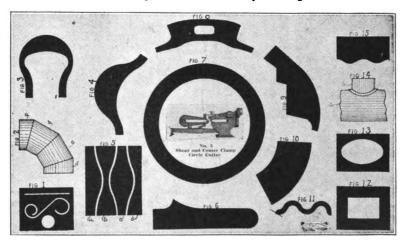
Made in 7 sizes.

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.

Save 50% to 90%.

Eliminates oxyacetylene cutting and plate planing.

Write for catalogue No. 60.



A Few Typical Shapes and Openings that Can Be Cut on "Quickwork" Rotary Shears

THE TOLEDO MACHINE & TOOL CO.

TOLEDO, OHIO, U. S. A.

Builders of Presses, Dies, Shears, Drop Hammers, Cam Drawing Presses, Circle Cutting Shears, Double Seaming Machines, Forging Presses, Horning Presses, Knuckle Joint Presses, Shovel Making Machinery, Spinning Lathes, Sprue Cutters, Etc.

THE "TOLEDO" OPEN BACK PRESSES:

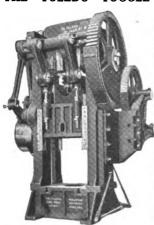


492

Series Nos. 1 and 70. Built in 30 sizes, weighing from 500 to 60,000 lbs. They are adapted for a great variety of work, including nearly every kind of blank cutting, forming, perforating, drawing,

shaping and combination die work. Illustrated in our catalog, Section No. 2-A

THE "TOLEDO" TOGGLE PRESSES:



Series No. **1**60. Built in sizes, weighing from 75,000 to 650,000 lbs. These presses are unexcelled for drawing stamped steel and enameled ware, seamless steel bath tubs, metallic caskets, automobile

bo dies, radiators, steel stove parts, elevator buckets and innumerable other articles made from brass, copper, aluminum, steel or tinplate. Illustrated in our catalog, Section No. 8.

THE "TOLEDO" PRESSES:

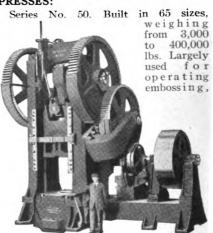




Series No. 30. Built in 15 sizes, weighing from 700 to 15,000 lbs. These presses are extensively used for a large variety of work, being especially suited for punching, shearing and cutting out blanks of heavy metalsteel, iron, brass, etc.; for operattrimming ing and forming dies, using bar and sheet metal

stock. Illustrated in our catalog, Section No. 4.

THE "TOLEDO" STRAIGHT COLUMN PRESSES:

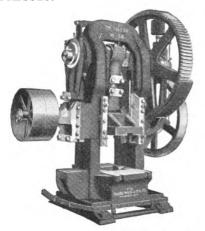


cutting and drawing dies, and reducing dies; for punching, piercing, shaping and stamping heavy blanks; also for trimming drop forgings, either hot or cold. Illustrated in our catalog, Section No. 6.

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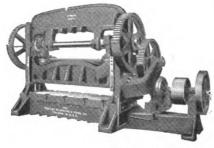
THE TOLEDO MACHINE & TOOL CO.

THE "TOLEDO" TRIMMING PRESSES:



Series No. 50. Built in 20 sizes, weighing from 4,500 to 200,000 lbs. These presses are especially adapted for use in drop-forging plants for trimming drop-forgings, either hot or cold, such as crank shafts, gear blanks, agricultural implements, hardware specialties and many other articles too numerous to mention. Illustrated in our catalog, Section No. 9-A.

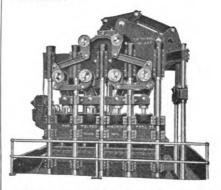
THE "TOLEDO" DOUBLE PRESSES:



Series No. 90. Built in over 200 sizes, weighing from 4,500 to 500,000 lbs. These presses, with either Straight Column or Overhanging Frames, embody the most advanced ideas in the construction of machines of this class.

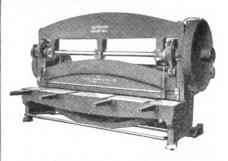
Their general uses are for cutting out and forming large articles in tin, brass, copper, sheet steel, cardboard, paper, cloth, etc. Illustrated in our catalog, Section No. 7.

THE "TOLEDO" RAIL FORMING PRESSES:



Series No. 890. Built in 4 sizes, weighing from 350,000 to 750,000 lbs. These have been especially designed for forming "rails" of channel section such as are used for automobile frames and similar work that calls for great accuracy and absolute uniformity, free from warping and buckling. Illustrated in our catalog, 493 Section No. 8.

THE "TOLEDO" SHEARS:



Series Nos. 400 and 500. Built in 100 Sizes, weighing from 1,500 to 100,000 lbs. These shears are noted for the ease, rapidity and accuracy with which they perform their work. They are used by many metal goods manufacturers, and in the largest timplate and steel mills, being subjected to continuous head used. being subjected to continuous hard usage. Illustrated in our catalog, Section No. 11-A.

Three Thousand Patterns from which to choose.

Correspondence Solicited Estimates Furnished

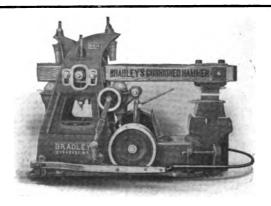
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C. C. BRADLEY & SON, INC.

Established in 1832

SYRACUSE, N. Y.

Manufacturers of Bradley Cushioned Power Hammers and Forges



The Bradley Cushioned Helve Hammer

BRADLEY HAMMERS are made in 494 Helve, Upright Strap, Upright Helve and Compact styles, with heads ranging from 15 lbs. to 500 lbs., and capable of forging iron, steel and other metals from five inches square down.

If your work is continuous, like plating, drawing, swaging, collaring, welding or spindle work, with infrequent changes in size of material, or if it is die work where perfect accuracy and the finest finish are imperative, let the Bradley Helve Hammer be your choice. No other Hammer is like it. No other Hammer can equal it.

If your work is of a general, all around jobbing character, with frequent variations in the size of stock, or is of such a nature that the Hammer is not worked continuously, but with frequent stops, a Bradley Upright Strap Hammer may best answer the purpose.

But if the work is continuous and severe, the Hammer running without rest hour after hour, day in and day out, the Upright Helve would answer a better purpose.

If your work is such as described last above, and your floor space is limited, but with good height, and a somewhat less first cost is an object, we suggest the Bradley Compact Hammer.

More Bradley Hammers are sold each year than of all other power Hammers combined. Separate circulars of each.

WE MAKE:

The Bradley Cushioned Helve Hammer.
The Bradley Upright Strap Hammer.
The Bradley Upright Helve Hammer.
The Bradley Compact Hammer.
Forges for Hard Coal or Coke.



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England Buck & Hickman, Ltd., London France. Fenwick Freres & Co., Paris, Lyon, Rhone Italy Fenwick Freres & Co., Turin Belgium Fenwick Freres & Co., Liege Brazil Fenwick Freres & Co., Liege Communication of the Co., Liege Brazil Fenwick Freres & Co., Liege Switzerland Fenwick Freres & Co., Zurich Spain Fenwick Freres & Co., Lisbon Portugal Fenwick Freres & Co., Lisbon Alsace-Loraine Fenwick Freres & Co., Lisbon Alsace-Lora

THE MASSILLON FOUNDRY AND MACHINE COMPANY

MASSILLON, OHIO

Manufacturers of Steam Drop Hammers, Steam Forging Hammers, Double and Single Frame, Air Operated Hammers

THE "MASSILLON" STEAM DROP HAMMER:

Made in all sizes from 600 lb. to 15,000 lb. falling weight.

Embraces all the features of the most modern ideas in Drop Hammer construction.

All Massillon cylinder lids are of the Safety Steam Cushion type, preventing any possible damage to operator or machine should rod pull out or break and fly up to top of cylinder under steam or air pressure.

The Massillon Steam Drop Hammers have no superior anywhere and are the best for all classes of Drop Forgings.

MASSILLON DOUBLE FRAME STEAM FORGING HAMMER:

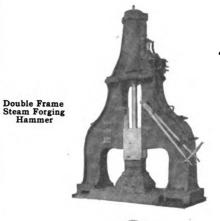
Made in all sizes from 600 lb. to 10,000 lb. capacity. These hammers contain all the latest improvements and while the illustration shows the straight style ram these can be furnished with skewed ram where desired.

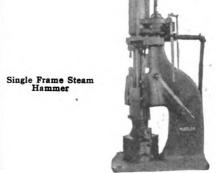
MASSILLON SINGLE FRAME HAMMER:

These hammers are of the latest design, will strike any desired force of blow, and with the unusual strength and thorough workmanship, permanent durability is ensured.

Work of any length can be welded, drawn and finished either way of the die. Adjustable guides take up wear of ram. Valve gear is simple and substantial, giving perfect control of the hammer and takes up its own lost motion by gravity. Buffer springs stop ram at top of stroke. An automatic oil pump lubricates both valves and cylinder. Can be operated equally well with compressed air.







495

WILLIAMS, WHITE & CO.

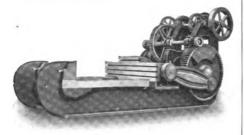
MOLINE, ILLINOIS, U. S. A.

PITTSBURGH OFFICE 808 House Bldg. New York Office 30 Church St. DETROIT OFFICE 65 Shelby St.

CHICAGO OFFICE 1624 Monadnock Block

Forging, Punching and Shearing Machinery

BULLDOZERS:

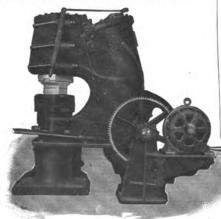


Bulldozer

Over forty years of Bulldozer manufacturing. These machines are used for an incredible number of purposes. General purpose Press with practically unlimited possibilities. Built in ten sizes and two types.

YEAKLEY VACUUM HAMMERS:

Recent and important improvements place this hammer at the head of Forging Hammers, both in power and control. Speed of blow is maintained, forging both light and heavy. Built in sizes from 40 to 650 lbs. Adaptable to motor drive.



YEAKLEY Hammer

JUSTICE SPRING HAMMER:

Silico manganese steel springs furnished.

MOLINE HELVE HAMMER:

Extra heavy in design.

BOARD DROP HAMMER:

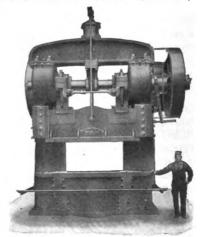
Very much improved. Exceptionally easy of operation and large output.

CRANK (OR ROPE LIFT) DROP HAMMERS:

Stand very severe service with comparatively small upkeep. Particularly adapted to the carrying of large dies, for bending, shaping, forming and straightening. Made in three styles of Lifters—Sandage, Ratchet and Peck.

MULTIPLE PUNCHES:

These machines are made in nine sizes with varying lengths and throats. Special adapta-



Multiple Punch

tions for special work furnished. Machines range in weight from 5,000 to 250,000 lbs.

PUNCHING AND SHEARING MACHINES:

"C" type, Double and Single End Machines. Open-fronted Bar Shears, and Guillotine Shears. COPING AND STRUCTURAL PUNCHES AND

SHEARS:

Complete line of the above machines, covering a wide range of throats, capacities, types

of jaw, equipment, etc. Our Line Also Includes:

Upsetting, Forging and Rivet Machines, Eye Benders, Multiple Head Tapping Machines, Bending and Straightening Machines, Horizontal Punches, Hydraulic Presses, Power and Trimming Presses, Stay Bolt Breakers, Rotary Riveting Hammers, Angle Bending Rolls and Angle Shears.

THE ACME MACHINE TOOL CO.

CINCINNATI, OHIO, U. S. A.

Code Word: ACME

Builders of Turret Machinery

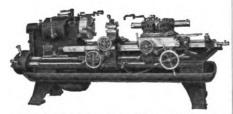
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497

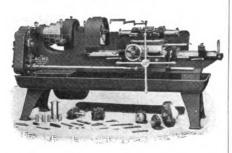
CINCINNATI ACME

FLAT TURRET LATHES, SCREW MA-CHINES, TURRET LATHES, BRASS WORK-ING MACHINES, UNIVERSAL TURRET LATHES, AND ALL TOOL ACCESSORIES:

FLAT TURRET LATHES, the double purpose machines. Adapted to both bar and chucking work. Using simple, inexpensive tools. The greatest producers of work from bar stock, forgings and castings. Capacity bar stock $2\frac{1}{4}$ " to $3\frac{1}{2}$ " and chucking work 12" to 17" diameter.



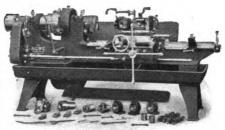
No. 3 Universal Flat Turret Lathe with Chucking Equipment



2¼" x 26" Flat Turret Lathe with Chucking Equipment

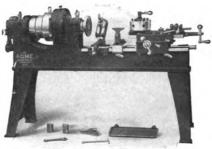


31/4" x 36" Flat Turret Lathe with Bar Equipment



21/4" x 26." Flat Turret Lathe with Bar Equipment

TURRET LATHES AND BRASS MA-CHINES made in four sizes. 14" to 20" swing. Plain or friction geared head, with or without automatic chuck, bar feed, automatic feed to turret, or cut off rest. Furnished with plain, set over or universal turret, also chasing attachment, forming attachment and all tools for rapid and accurate production.



18" Universal Turret Lathe

SCREW MACHINES made in five sizes. Automatic Chuck capacity \(\frac{5}{8}'' \) to 2\(\frac{1}{4}'', 11'' \) to 20'' swing. Plain or friction geared head with or without automatic feed to turret.

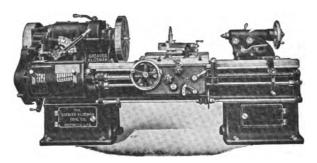


21/4" x 11" Screw Machine

THE GREAVES-KLUSMAN TOOL CO.

CINCINNATI, OHIO

Manufacturers of Engine Lathes



24" Heavy Quick Change Geared Head Lathe

THE G-K WAY:

The prime object in the design and construction of G-K Lathes is to give to their users a machine that will withstand the severe strains, the long and continuous heavy duty that is expected of the modern machine tool of to-day.

This is accomplished by devoting our entire energy and equipment to the manufacturing of Engine Lathes. Our long experience in this line enables us to offer machines of the highest type and efficiency for the increasing demands of up-to-date shop practice.

We build a complete line of Engine Lathes, from 14" to 30" inclusive and have a new list which illustrates and names all parts on these lathes. Our 14", 16" and 18" Lathes are built with four styles of Headstock:

Four Step Cone Single Back Gear.

Three Step Cone Friction Double Back Gear.

Geared Head, Single Pulley Drive. Variable Speed Motor Drive.

Our 20", 24" and 30" Lathes are built in three styles:

Three Step Cone Friction

Double Back Gear.

Geared Head, Single Pulley Drive.

Variable Speed Motor Drive.

All sizes of machines are built with Quick Change Mechanism.

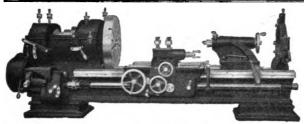


14" Heavy Quick Change Three Step Cone Friction Double Back Gear Lathe

THE HOUSTON, STANWOOD & GAMBLE COMPANY

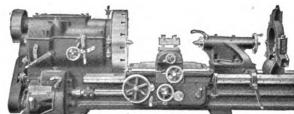
CINCINNATI, OHIO

Manufacturers of Large Size Engine Lathes

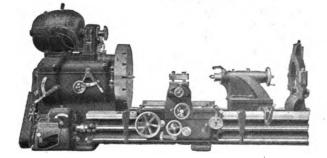


With Cone Drive

With Single Pulley Drive

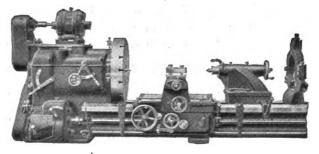


499



With D. C. Variable Speed Motor

With A. C. Constant Speed Motor



HIGH POWERED ENGINE LATHES:

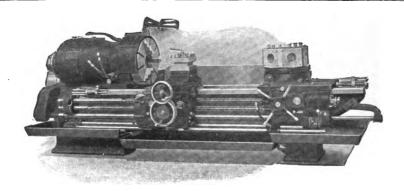
Extra Heavy Design in 36", 42", 48", 54", 60" and 72" Swings.

STEEL, gears throughout. Internal gear in face plate is steel FORGING. TOOTHED positive clutches for carriage feeds. Accurately built, large capacity, production tools.

INTERNATIONAL MACHINE TOOL COMPANY

1124 W. 21st St., INDIANAPOLIS, IND.

Manufacturers of the "Libby" Turret Lathes



"LIBBY" TURRET LATHE:

At present we are offering two sizes, our 16-18" type "A" machine with $3\frac{9}{16}$ " hole through the spindle and our 24-26" type "C" machine with either 4½" or 7½" hole through the spindle. The type "A" machine will swing 16" over the tool post carriage and 18" over the ways; the type "C" machine will swing 24" over the tool post carriage and 26" over the ways.

Design is Right: In designing, building and offering the "LIBBY" Lathe we have had in mind the following prime factors:

A line of heavy duty turret lathes capable of forming, facing, turning and boring chucked pieces up to 26" in diameter and bar work up to 71/4" in diameter.

An all-geared head machine with a single pulley drive.

A machine with a side carriage, permitting the full swing of the work.

A machine with flat ways so located as to receive, as nearly as possible, all the cutting strains on the flat ways.

A machine with the best relative number of feeds and speeds for maximum quantity and quality production.

A machine with all feeds for each carriage independent one of the other.

A machine with convenient power rapid traverse for each carriage, independent one of the other and of the feeds.

A machine with abundant power for pulling heavy extensive cuts.

A machine with abundant rigidity and stiffness to easily carry heavy strains and produce accurate work continuously.

A machine so convenient to handle and easy on the operator that there would be every incentive to keep the machine under cut a maximum percentage of the time and thus give a maximum production.

We Claim for the "Libby" Lathe: That the limit of its production is the limit of the ability of the cutting tools to stand up.

That it is adapted to successful, rapid, continuous service under the most severe conditions.

That it is at its best in heavy work—several broad faced or other cutting tools working at one time.

That on account of its strength, rigidity and stiffness it will produce work free from chatter with smooth, accurate finish.

That the control of the machine is so concentrated and the convenience for operation so great that men like to operate a "LIBBY" Lathe and consequently push production with a minimum of fatigue.

INTERNATIONAL MACHINE TOOL COMPANY

CONDENSED DATA ON "LIBBY" LATHES

Swing over ways. Swing over carriage. Travel of turret carriage. Travel of tool post carriage. Greatest boring depth capacity. Hole in spindle.	18½ in. 17¼ in. 44 in. 40 in.	26½ in. 24 in.	26½ in.
Swing over carriage	17¼ in. 44 in.	,	4072 III.
Travel of turret carriage Travel of tool post carriage Greatest boring depth capacity	44 in.	24 in.	24 in.
Travel of tool post carriage		72 in.	72 in.
Greatest boring depth capacity	40 in.		
		72 in.	72 in.
Hole in spindle	13 in.	23 in.	23 in.
-	3 m in.	4½ in.	7½ in.
Three-jaw Universal chuck	16 in.	22 in.	22 in.
Front bronze bearing	4 1/8 in. x 7 1/6 in.	6½ in. x 8¼ in.	9½ in. x 8¼ in.
Rear bronze bearings	4½ in. x 5¾ in.	534 in. x 516 in.	8¾ in. x 5½ in.
Drive pulley—diameter	18 in.	18 in.	18 in.
Countershaft speed	480	500	360
Width of belt	4 in.	8 in.	8 in.
Horse power of motor	10	20	20
Speed of motor (constant)	1200	1200	1200
Speed of motor (variable)	750 to 1600	750 to 1600	750 to 1600
Size of motor pulley at 1200	4½ in. x 7¼ in.	8½ in. x 7½ in.	8½ in. x 5½ in.
R. P. M	diam.	diam.	diam.
Width of front way	51/8 in.	6 in.	6 in.
Width of back way	3½ in.	4½ in	4½ in.
Turret slide bearing on ways	276 sq. in.	316 sq. in.	316 sq. in.
Tool post slide bearing on ways	141 sq. in.	144 sq. in.	144 sq. in.
Diameter turret base	12 1/2 in.	16 in.	16 in.
Diameter of turret across flats	14 in.	18 in.	18 in.
Hole in turret bushed to	3¼ in.	4 1/4 in.	41/4 in.
Center of turret holes over ways	9 in.	125% in.	125% in.
Number of turret feeds	10	10	10
Range turret feeds	1/256 in. to ¼ in.	1/256 in. to ¼ in.	1/256 in. to ¼ in.
Diameter of tool post	7 in, sq.	9 in. sq.	9 in. sq.
Tool post feeds	6	6	6
Range of feeds	1/128 in. to ¼ in.	1/128 in. to ¼ in.	1/128 in. to ¼ in.
Power cross feeds	6 e	6	6
Range of cross feeds	1/128 in. to ¼ in.	1/128 in. to ¼ in.	1/128 in. to ¼ in.
Screw cutting change gears	7	7	7
Threads per inch	2 to 32	2 to 32	2 to 32
Number spindle speeds	8	8	8
Range spindle speeds	8 to 300	8 to 238	8 to 142
Range spinute speeds	1.87 to 1	2.1 to 1	2.53 to 1
[1]	2.75 to 1	3.3 to 1	3.5 to 1
i i			6.7 to 1
i	5 to 1	5.6 to 1	
Gear ratios	8 to 1	8.8 to 1	9.3 to 1
[.]	13 to 1	14.9 to 1	12.2 to 1
[]	20 to 1	23.5 to 1	16.9 to 1
[1]	38 to 1	40.1 to 1	32 to 1
	60 to 1	62.5 to 1	45 to 1
Floor space	60 in. x 138 in.	71 in. x 170 in.	71 in. x 170 in.
Radial sweep of bar	33 in.	57 in.	57 in.
Rapid traverse per minute	40 ft.	35 ft.	35 ft.
Net weight	7600	12000	13500
Shipping weight	8000	12600	14000
Shipping weight—export	9200	14000	15000
Space occupied—export	250 cu. ft.	390 cu, ft.	390 cu, ft.

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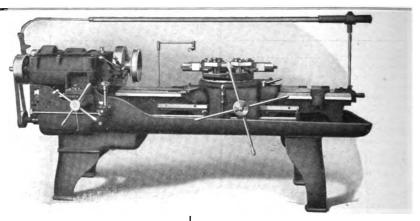
501

JONES & LAMSON MACHINE CO.

SPRINGFIELD, VERMONT, U. S. A.

503 MARKET STREET, SAN FRANCISCO, CAL.
109 QUEEN VICTORIA STREET, LONDON, E. C.
France, Spain and Belgium: F. Auberty & Co., 91 Rue de Maubeuge, Paris
Holland: Spliethoff, Beeuwkes & Co., Rotterdam
Japan, Korea, Etc.: Mitsui & Co., Ltd., Tokio
Australia and New Zealand, McPherson's Pty., Ltd., 554 Collins St., Melbourne

Manufacturers of Hartness Flat Turret and Automatic Lathes



HARTNESS FLAT TURRET LATHES:

502

The Hartness Flat Turret Lathe with cross-sliding head is made in two sizes, and may be furnished with an equipment of tools for either bar work or chuck work, or a double equipment for both bar and chuck work.

The smaller machine is called the $2\frac{1}{2}$ x 24-inch, and when equipped with the automatic die outfit of tools it turns nearly every conceivable shape from the bar, up to $2\frac{1}{2}$ inches diameter and 24 inches of length. On chuck work its capacity is $12\frac{1}{2}$ inches diameter or less.

The 3 x 36-inch size handles bars of stock up to 3 inches in diameter, turning pieces up to 36 inches in length. It may also be equipped for chuck work up to 14½ inches in diameter.

SPECIAL FEATURES:

The Original Flat Turret:

The Flat Turret was put on the market in 1891. Over thirteen thousand (13,000) machines equipped with them have been built and sold since, to the great satisfaction of the users. A large, steady tool clamping surface, a circular gib holding the turret down clear around its periphery, a locking pin directly under the cutting point of the tool—all

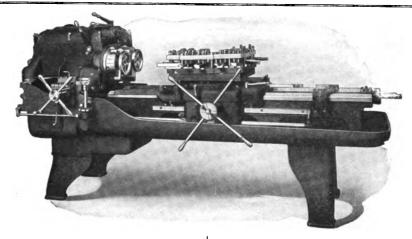
these features combined to set a new standard of output, accuracy and range of work in turret lathe practice.

The unique set of tools employed covered at one leap the evolution from the old-fashioned "screw machine" to the modern turret lathe. It enabled the turret lathe to practically displace the engine lathe on bar and stud work.

The Cross-Sliding Head:

This feature, introduced in 1903, still further extended the field of the turret lathe, making it the standard machine for most chuck work of moderate size. The Cross-Sliding Head has three advantages: (1) It offers a cross-sliding motion gibbed directly and securely to the bed. There is no piling of slide on slide, no narrow bearing foundation for a lofty superstructure of slide, tool holder and tool. The design is so stable that the piloted type of holder is seldom needed. (2) It permits the cross feed to be applied to every tool on the turret if necessary. (3) By allowing a cross adjustment to every tool, complicated and costly special tools are minimized. The regular outfit covers all regular work.

JONES & LAMSON MACHINE CO.



THE DOUBLE-SPINDLE HARTNESS FLAT TURRET LATHE:

The special field of usefulness of the "Double-Spindle" Hartness Flat Turret Lathe is in machining moderate sized castings, forgings, and certain limited classes of bar work in large lots for quantity of production. In addition it may be used as a single-spindle machine of larger capacity, in which case it is adapted to small lot manufacture.

The machine has all the good qualities of the Single-Spindle Hartness Flat Turret Lathe which we introduced nearly a quarter century ago. With the expiration of the original patents, the flat turret has been adopted by other makers as the standard design for manufacturing work. But our later developments, like the cross-sliding head and the essential features of the double spindle, are of great mechanical and economic value to the manufacturer and are found exclusively in these machines.

The double-spindle feature nearly doubles the output per operator and per machine.

Two spindles, two sets of tools, two pieces of work.

One turret, one machine, one operator, one set of motions.

SPECIFICATIONS:

Working Range: Swing over ways is 17 inches when used as a single-spindle machine 10½ inches when both spindles are used. Cross travel of head is 10½ inches. Hole through, spindle is 3½ inches.

The Cross-Sliding Head: This is the only turret lathe in which the work-carrying head-stock has a cross travel. This is indispensable on chuck work and is frequently convenient on bar work. It gives a cross feed for every tool without resorting to the frail double slide under the turret. Nine speeds in both directions from 19 to 301 revolutions per minute instantly obtainable. All gears run in oil bath.

The Turret: This is the original flat turret, 22 inches square, and is gibbed near outer edge. Index pin is located directly under working tool. On single-spindle work the corners of the turret can be used, giving eight positions in all.

The Power Feed: Both the carriage and the cross-sliding headstock are provided with power feed. It operates in both directions; has nine changes from 20 to 113 revolutions per inch of travel. These changes are instantly obtainable by sliding gears.

Stops: Each of the eight positions of turret is equipped with a separate stop, and there are four extra stops, making twelve in all. If desired, six stops can be used for one tool. The cross travel of the head is controlled by nine stops. Both sets of stops act in both directions and are placed as near as possible to the direct line of stress.

Floor Space for Machine is 5 x 10 feet. Approximate weight: net, 6600 pounds; crated, 6700 pounds; boxed for export, 7800 pounds. Cubic measurement, 240 cubic feet.

SEE OURADYTEIN MECHANICAL ENGINEERING THE ASMED

(Continued on next pages)

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E02

(Continued from preceding pages)

JONES & LAMSON MACHINE CO.

SPRINGFIELD, VERMONT, U. S. A.

THE FAY AUTOMATIC LATHE:

The Fay Automatic Lathe is a real lathe, with nine speed, all steel geared head-stock, with three automatic speed changes, tailstock, carriage and bed. It differs from the engine lathe in the details of its mechanism, which fit it especially for the particular work it is designed to do. There is also the added mechanism required to make it automatic in all its motions.

sand and one other pieces of the kind used in textile machinery, automobiles, machine tools, electrical work and machine building in general.

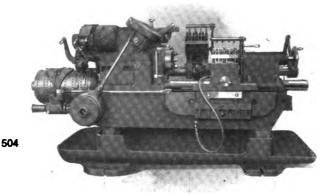
Second operation work is the legitimate field of the Fay Lathe.

Furthermore, it has a large field of usefulness in the accurate finishing of

> parts roughed out on other and less accurate automatic machines.

On the work described above the Fay Lathe will do straight turning, taper turning, form turning, straight facing, bevel facing, recessing, singly or in combination, with roughing or finishing cuts. It will do everything of this sort except threading, for

which it is not adapted.



Field:

The Fay Lathe is designed for the automatic turning of work held on centers. It is thus adapted to work which is itself centered, or to work which is mounted on an arbor.

In the class of centered work are included such standard parts as steering knuckles for automobiles, driving gears for transmission, forgings in general of such shape as to be turned rather than chucked, and many miscellaneous castings of the same type.

In the class of work done on arbors is included the large variety of parts which in ordinary practice is turned in the engine lathe by this means, as pulleys (either straight-faced or crowned), gear blanks, flanges, disks, hubs, and a thou-



Profitable Work for the Automatic Lathe

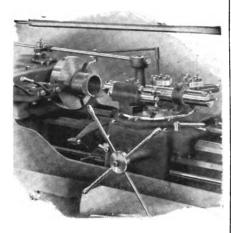
Advantages of the Fay Automatic:

- 1. Ease of setting.
- 2. Rapidity of changing work.
- 3. Two pieces at a time.
- 4. Multiple tooling.
- 5. Taper turning and bevel facing.
- Form turning.
- 7. Turned surfaces free from scoring on the return movement.
- 8. Flexibility of mechanism.
- 9. Facing and turning simultaneously.
- 10. One operator runs two machines.

JONES & LAMSON MACHINE CO.

AUTOMATIC

CHASING ATTACHMENT:



The Hartness Chasing Attachment is shown applied to the Flat Turret Lathe.

This attachment is automatic. The carriage is locked to the bed and the attachment clutched with its positive drive from the work spindle. The threading tool feeds forward at cutting depth under lead screw control until the tool bar strikes a stop. The tool is then withdrawn to clear the work and returned at high speed to the starting point, where it is again fed in to cutting depth and engaged with the lead screw. The work spindle revolves continuously. The only motion required of the operator is that of adjusting the cross sliding head forward a slight amount during the return of the cutter to feed the tool in for the new cut. There is no possibility of overrunning and gonging into a shoulder, no matter how fast the machine is run.

The advantage of this attachment is that it gives engine lathe accuracy to turret lathe threading—and it gives much more than engine lathe speed.

DIE DIVISION MANUFACTURING HARTNESS AUTOMATIC DIES:

Wide Range High Accuracy Few Dies Small Expense

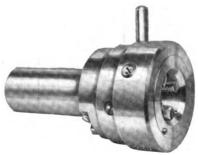
No. l Die: Range for standard threads, from $\frac{3}{32}$ inch to $\frac{9}{16}$ inch diameter, any length. Particularly adapted for small hand or automatic screw machine work.

No. 2 Die: Range, $\frac{1}{2}$ inch to 1 inch diameter, 10 pitch and finer. Owing to the small outside diameter, $3\frac{1}{16}$ inches, this die is particularly adapted for automatic screw machine work. This die is also made in the revolving type.

No. 4 Die: Range, $\frac{1}{4}$ inch to $\frac{1}{4}$ inches diameter. This die is suitable for general turret lathe and screw machine use. It is especially adapted for use in automatic screw machines, owing to the compactness of its design.

No. 6 Die: Range, 34 inch to 2 inches diameter. This die is adapted for medium to large work on screw machines, and turret lathes, and for the larger 505 sizes of automatic screw machines.

No. 9 Die: Range, 134 inches to 3 inches diameter. This die is designed for the heaviest turret lathe work. It is provided with six chasers, and has a special double roughing attachment which adapts it particularly to large diameters or coarse pitches.



The No. 2 Hartness Automatic Die

Any of these dies, even the large No. 9, will thread pitches as fine as 32 per inch on its largest diameter without danger of stripping.

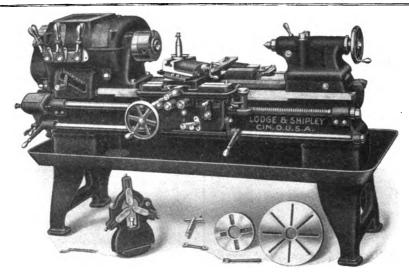
The lead-controlling feature is exclusive with this die. You can cut long threads as accurate in pitch as you will get from the ordinary engine lathe.

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THE LODGE & SHIPLEY MACHINE TOOL COMPANY

CINCINNATI, OHIO

Manufacturers of the Lodge & Shipley Tool Room, Manufacturing, Crankshaft and Engine Lathes



506

Manufactured in Sizes 14" to 20"

THE LODGE & SHIPLEY TOOL ROOM LATHE:

A tool room lathe embodying accuracy and adaptability is certain to be a success. These features in no small way account for the popularity of the LODGE & SHIPLEY TOOL ROOM LATHE.

Years of constant improvement have made it such that today it can be relied upon absolutely to do the most intricate jobs of the tool room. The regular equipment includes taper attachment, pan and draw-in chuck without collets, which are furnished as extras. Relieving attachment and belted motor drive on head also furnished as extras.

The TAPER ATTACHMENT is bolted to the back of the carriage and is always ready for instant engagement.

It in no way interferes with the regular operation of the lathe. For convenience of the operator, all operations necessary to engage or disengage the attachment, are made from the operator's position in front of the machine.

The compound rest bottom slide is clamped to the taper attachment bar, giving a one piece construction from the tool rest to the taper shoe. The depth of cut is adjusted by the cross feed screw while the taper attachment is engaged.

The DRAW-IN CHUCK is so designed as to eliminate the long tube through the spindle. This makes it possible to handle work up to $1\frac{5}{16}$ diameter and unnecessary for the operator to leave his position in front of the lathe.

The PAN is built onto the lathe to catch all chips, etc.

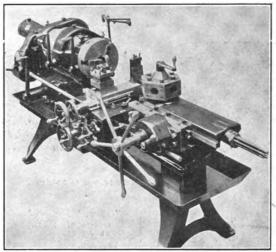
These attachments, when combined with the many other features on the LODGE & SHIPLEY lathe, make it an ideal one for the tool room.

We also manufacture Engine Lathes in sizes from 14" to 60" and Manufacturing Lathes from 14" to 30". Write for bulletins.

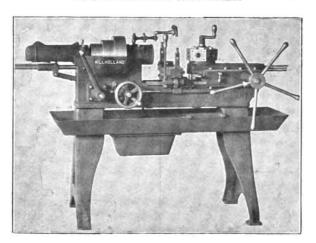
MILLHOLLAND MACHINE CO.

INDIANAPOLIS, INDIANA

Builders of "Millholland" Screw Machines and Turret Lathes



No. 4 Universal Turret Screw Machine



No. 2 Screw Machine, I x 7 Capacity

TURRET SCREW MACHINES:

Sizes 1 x 7, 15% x 10, and $2\frac{1}{4}$ x 10 capacity.

MILLHOLLAND MANUFACTURING TURRET LATHES:

Sizes 21/2 x 14, and 31/2 x 36. Chucking | upon request.

capacity 18". Designed for broad facing cuts, all tools fed by screw. Bar and chucking equipments are readily interchangeable.

Catalog fully describing machines sent upon request.

507

OLIVER MACHINERY COMPANY

GRAND RAPIDS, MICHIGAN

NEW YORK

508

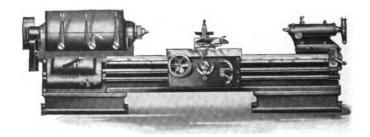
CHICAGO

St. Louis

Los Angeles

SAN FRANCISCO

Manufacturers of Engine Lathes—Filing Machines, Pattern Shop Equipment, Woodworking Machinery, Snap Flasks for Foundries, Filing Room Machinery



"Oliver" ENGINE LATHES 16-Inch to 30-inch



"Oliver" No. 60 Universal Saw Bench

The Oliver Line comprises every woodworking machine required for the Pattern Shop.



"Oliver" No. 34 Disc and Spindle Sander

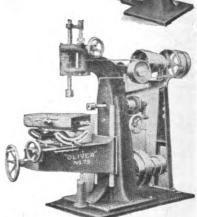
Ball bearing fitted with three sanding drums. Both tables tilt.

Send for Complete and Illustrated Catalog.

"Oliver" No. 404 High Power Filing Machine.

(Rearwin Patent)

Capacity to take files up to 12 inches long. 80 to 320 strokes per minute. Adjustable as to length. Table 17" x 18" tilts up to 7 degrees.



"Oliver" Pattern Milling Machines made in two sizes to operate on wood or aluminum patterns. Almost unlimited capacity for making patterns, core bases and various shapes. A wonderful time saver in any pattern shop.

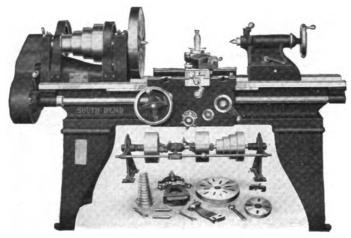
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SOUTH BEND LATHE WORKS

Established 1906

SOUTH BEND, INDIANA

Manufacturers of "South Bend" Engine Lathes



No. 40-C, 16" Lathe with Straight Bed. Price \$550.00

509

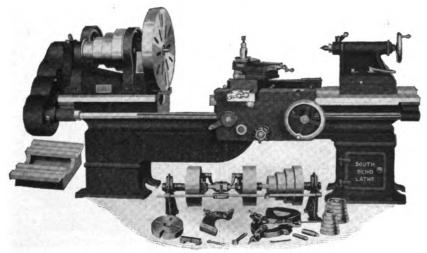
MADE IN SIX SIZES:

13", 15", 16", 18", 21" and 24" Swing with Beds from 4 ft. to 16 ft. in length.

Made with straight or gap bed. Price includes equipment as shown in illustration. South Bend Lathes have been

on the market fourteen years—over 26,000 in use. Free Catalogue mailed on request.

How to Run a Lathe. An 80-page book, post-paid to any address for 10c., silver or stamps accepted.



No. 154-24" Lathe with Gap and Bridge. Price \$1400.00

THE WARNER & SWASEY CO.

CLEVELAND, OHIO

NEW YORK

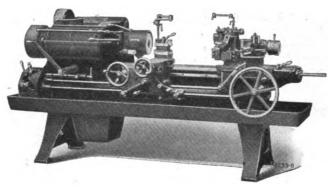
Boston

BUFFALO

DETROIT

CHICAGO

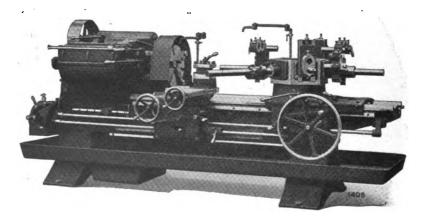
Manufacturers of Turret Machinery



NO. 2-A Universal Hollow-Hexagon Turret Lathe: Bar Equipment Two Capacities—2½"x29"; 16½" swing—3½"x29"; 16½" swing

510 UNIVERSAL HOLLOW-HEXAGON TURRET LATHES:

Rapid and accurate production were the considerations in developing the Universal Hollow-Hexagon Turret Lathe. As many as ten tools may be used in one set-up, the hexagon turret carrying six and the square four. The two turrets work simultaneously on a number of jobs, often reducing the cutting time in half. These machines have more than enough power to push to the limit the best high speed steel cutters known to present industry. The design of the head and turrets, and their general construction have gained for them the enviable reputation of delivering the greatest accurate production physically possible for a turret lathe.



No. 3-A Universal Hollow-Hexagon Turret Lathe: Chucking Equipment Two Capacities—3½"x44"; 21½" swing—4½"x44"; 21½" swing

THE WARNER & SWASEY CO.

CLEVELAND, OHIO

NEW YORK

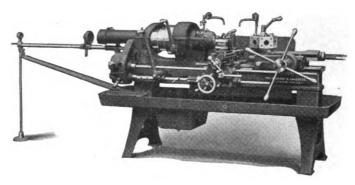
Boston

BUFFALO

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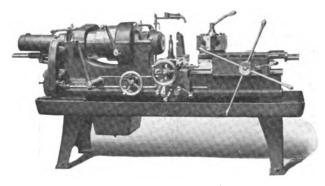
Manufacturers of Turret Machinery



No. 4 Universal Turret Lathe: Bar Equipment Capacity: 1½"x10"; 16" swing

THE NO. 4 UNIVERSAL TURRET LATHE is extensively used for bar and chucking work slightly smaller than that which can be handled economically on the universal hollow-hexagon turret lathes. With its power-driven turret and carriage and its wide range of speeds and feeds it is distinctly a universal machine.

THE NO. 6 TURRET LATHE is equipped with double friction back gears, and with or without automatic chuck, bar feed, and power feed to turret. Either the standard or heavy duty carriage is furnished with the machine. With the heavy duty carriage on the No. 6, gear blanks, forgings, and tough alloy steels requiring heavy forming and facing cuts are handled to great advantage. Then, too, it is as easy to operate on the ordinary jobs as a machine without its reserve strength.



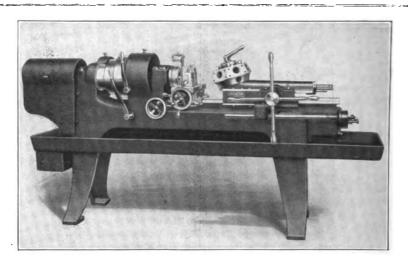


No. 6 Turret Lathe: Double Friction Back Gears
Capacity: 2¼ "x12"; 20¾ " swing
Other Turret Lathes from ¾ " capacity

WOOD TURRET MACHINE CO.

BRAZIL, INDIANA, U. S. A.

Manufacturers of the Tilted Turret Lathes and Screw Machines



THE TILTED TURRET Screw Machines and Turret Lathes constitute a line of strictly high grade machine tools which are the result of broad experience, unexcelled facilities, together with a personnel of specialized mechanics.

> Workmanship throughout is of the highest class. They are easy to operate, rigid in construction and will hold their ac-curacy indefinitely. Wearing parts are so constructed that they can be adjusted USERS. ASK THE USER.

Without power feed to turret slide Poplar With power feed to turret slide Pine

without changing the alignment of turret or spindle.

We specialize exclusively in manufacturing THE TILTED TURRET screw machines, turret lathes and tools for manufacturing from a pin to a locomotive. Since the introduction of THE TILTED TURRET, it has had a steady

THE TILTED TURRET. SEMI-AUTOMATIC. FRICTION-GEARED HEAD

No. 2	No. 3	No. 4	No. 5	No. 6
	Plum Peach	Robin Sparrow	Thrush Eagle	Dove Lark
1 1 7 7 7 8 P 13" 12"	1 t " 1 t " 3 ½ " 8 P 13" 12"	178" 118" 378" 8 P 1314"	2½8″ 1¼8″ 5½″ 6 P 15″ 14″	21/2" 21/6" 51/6" 6 P 15" 14"
3" 614" 1" 312"	3" 714" 114" 314" 10"	3" 734" 114" 10"	31/2" 101/8" 1 /4" 4"	31/4" 101/4" 2" 41/4"
10"x3¾" 325 36"x96"	10"x4¼" 300 36"x102" 2440	12"x4½" 250 40"x108" 2540	14"x47%" 225 44"x128" 3830	30" 14"x47%" 200 44"x132" 4030
	2815 102 cu. ft.	2915 102 cu. ft.	4495 190 cu. ft.	4725 190 cu. ft.
nuck but w	ithout Bar	Feed		
	Willow Oak	Swallow Owl	Oriole Quail	Gull Raven
	Ouince 1	Prune Ouince 1 th " 1 th " 1 th " 3 th " 4 th " 3 th " 4 th " 4 th " 4 th " 4 th " 5 th " 6 th " 7 th " 1 th " 3 th " 1 th " 3 th " 1 th " 3 th " 3 th " 1 th " 3 th " 3 th " 3 th " 1 th " 3	Prune	Prune Ouince Plum Peach Sparrow Eagle

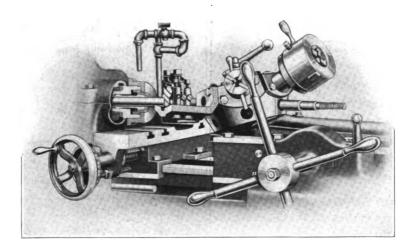
Magpie Buzzard

| Maple | Crow | Canary | Walnut | Hawk | Wren

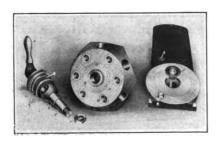
WOOD TURRET MACHINE CO.

THE TILTED TURRET, SEMI-AUTOMATIC WITH PLAIN HEAD

Number of Machine	No. 1	No. 2	No. 3
Automatic chuck capacity	3/4"	1"	11/4"
Diameter hole in spindle (auto. chuck removed)		15 "	1 9 "
Diameter hole in auto, chuck plunger	11 "	17"	15"
Diameter thread on spindle	3"	1 16 " 3 78 "	376"
Pitch of thread on spindle		8 P	8 P
Swing over bed		13"	13"
Large diameter cone		11"	12"
Width of belt	21/2"	3"	31/2"
Diameter of turret (across the flat)	512"	71/4"	734"
Diameter of holes in turret		174	11/2//
Center of holes in turret to top of slide	95/11	31/2"	2174
	278	10"	31/2"
Effective motion to slide	12"	16"	10"
Max. dist. end of spindle to face of turret (hand feed machine)	10"-01/"		16"
Friction pulleys on countershaft		10"x3¾"	12"x41/4"
Countershaft speed		225	200
Floor space	67½"x27"	73"x28"	76"x28"
Weight, crated, domestic shipment, about	1275 lb.	2034 lb.	2204 lb.
Weight, boxed, foreign shipment, about	1700 lb.	2358 lb.	2528 lb.
Bulk, boxed, about	69 cu. ft.	86 cu. ft.	86 cu. ft.
Code word	Apple		
Without power feed to turret slide	100	Banana	Barberry
With power feed to turret slide		Baneberry	Bayberry
With auto, chuck, without bar feed	Apricot		
Without power feed to turret slide		Bilberry	Bean
With power feed to turret slide		Cucumber	Beet
Without auto, chuck and bar feed	Blueberry	12.35	
Without power feed to turret slide		Cherry	Chickpea
With power feed to turret slide		Chesty	Citron







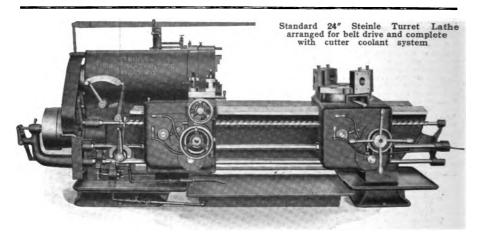
Can a turret lathe or screw machine be designed and manufactured so as to be a precision machine and retain this accuracy under the present-day demand for maximum production?

Send for The Tilted Turret Lathe and Screw Machine Encyclopedia, and decide for yourself.

STEINLE TURRET MACHINE CO

MADISON, WISCONSIN

Originators of the Heavy Duty Full Swing Side Carriage Turret Lathe



STEINLE 24" FULL SWING SIDE 514 CARRIAGE TURRET LATHE:

A modern high power heavy duty turret lathe in the design of which particular attention has been given to strength and rigidity, power, the application and rigid support of proper tool equipment, labor and time-saving features and convenience of operation.

Manufacturers of gasoline engines, alcohol or distillate engines, steam engines or pumps in sizes of 20" cylinder bore or smaller or any class of service will find in this machine a great producer in either large or small quantities of such parts as pistons, cylinder heads, cylinders, flywheels, eccentrics, piston or bull rings, cross-heads, bonnets, valves, glands, stuffing boxes, and various other parts.

Truck and tractor parts including gear blanks from iron or steel castings, forgings, or bar stock; hubs, differential housings, axle housings, etc., can be produced economically on this machine.

General Specifications

Ochciai opecimeations
Swing-over ways24"
Swing-over side carriage21 1/2"
Hole through spindle4" or $6 \frac{1}{4}$ "
Diameter of turret flats21"
Diameter of turret face holes3"
Traverse of turret
Traverse of side carriage56"
Reversible spindle speeds30
Range of speeds, 4" bore4 to 168
Range of speeds, 61/4" bore7 to 168
Number of carriage feeds64
Range of carriage feeds04 to .5
Number of cross feeds64
Range of cross feeds02 to .25
Screw cutting range
Diameter of chuck19"
R. P. M. of motor360
Diameter of pulley16"
Horsepower of motor10
Net weight, approximate10,500 lbs.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

CLEVELAND, OHIO

Manufacturers of Automatic Screw and Forming Machines

OUR AUTOMATICS ARE EASY TO OPERATE—CONSEQUENTLY THEY ARE STEADY PRODUCERS:

The Cleveland Automatic Machine Co. has been in business since 1891.

We manufacture four designs of automatic screw and forming machines.

Our plain pattern machine is low in cost and exceptionally speedy in outputs and is intended for work not requiring many operations.

We build sizes from 38" which will handle 36" bar weighing one ounce, up to a bar 8" in diameter weighing 1600 pounds. Our smallest machine weighs 1300 pounds and our largest machine weighs 8 tons.

We can use as many as ten tools in one operation on pieces up to 18" long.

There is scarcely any kind of apparatus manufactured containing metal, from dental tools to locomotives, where our machines are not used in producing some of the parts.

We use attachments of various kinds for magazining the work automatically, thereby doing away with second operation on pieces separated from the bar, also in the handling of castings of various shapes reducing the cost in some in-



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stances 200% over other methods where automatics are not used.

There are no other manufacturers in the world who build as many designs or as large automatics as we do.

Our variable speed motor driven automatics have no equal nor anything approaching them.

Our machines are used from coast to coast in this country and all over Europe, and as far away as Australia and Japan.

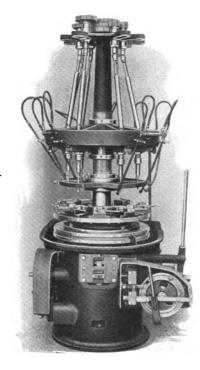
A great portion of our work is figured from blue prints. We name the price of the machine and tools and the guaranteed outputs.

CINCINNATI AUTOMATIC MACHINE CO.

CINCINNATI, OHIO

Manufacturers of Multiple Spindle Screw Machines and Drilling Machines

CINCINNATI-GRIDLEY AUTOMATIC MULTIPLE SPINDLE DRILL:

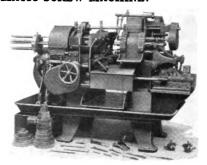


This machine is in reality a vertical screw machine, having a decided feature of "progressive operations." It drills, reams, counterbores, and faces, and differs radically from other drilling machines, inasmuch as the spindles are adjustable in 3 ways. Radially-up and down-and angular. This enables the locating of all spindles at a common point, or at different points. Holes can be drilled cutting into each other, or as far apart as the capacity of the machine permits.

It is well adapted for drilling, reaming and counterboring parts for automobiles; cash registers; adding machines; and all kinds of electrical work. In fact, any work having a multiple number of holes.

In requesting information relative to Drills it always proves to mutual advantage if we have blue prints, sketches, or samples of the work to be performed. This enables us to give an inquiry our best attention and to advise whether the work is adapted to the Drill or not.

CINCINNATI FIVE SPINDLE AUTO-MATIC SCREW MACHINE:



CAPACITY—The capacity of this Multiple Spindle Automatic Screw Machine is 34" diam. round, 56" hexagon, 1/2" square, turns any length to 3" and will feed any length to 31/8".

FEATURES OF SUPERIORITY:

5 spindles.

Run in forward direction (right-hand Tools, Drills, etc.). Spindle Stopping Arrangement, one or two

Spindle S spindles.

Correct Threading Speed.

No Reverse of Die or Live Spindle. Right and left-hand thread mechanism complete on machine.

Single Belt Drive.

Simple Motor Drive Arrangement.

Change Gears give 14 changes of Spindle Speeds. Change Gears give 22 changes of time to make one piece.

Index plates on machine, make books and reference tables unnecessary

Any throw desired within capacity obtained with cams on machine.

Nine tools can be operating together. Four cross slides for circular tools, etc.

Each cross slide universally adjusted, has independent stops.

Five longitudinal tool spindles for turning, drilling, etc.

Each of nine tools has its own cam.

Locking pin can be released to index head by hand

Machine can run without chucking or feeding, a convenience in setting up. Starting and stopping lever on each side of

machine A chain driven Pump supplies oil; driven from constant running shaft.

Feed driven by friction clutch, as a safety. Time for indexing head and bringing tools into

position, constant 2 seconds. Simplicity of design and ease of manipulation.

Complete specifications and descriptive literature sent on request.

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THE NEW BRITAIN MACHINE CO.

NEW BRITAIN, CONN.

Manufacturers of Automatic Screw and Chucking Machines

MULTIPLE-SPINDLE A U T O - MATIC CHUCKING MACHINES:

Single- and Double-Head Types

Designed for finishing castings, forgings, and second operations on screw-machine products. All operations performed simultaneously and automatically, the time required to complete a piece involving a series of operations being only that of the longest single operation or subdivision thereof. Productions three to five times those of the turret lathe or hand screw machine.

MULTIPLE-SPINDLE AUTO-MATIC CHUCKING MACHINE:

Work-Rotating Type

Adapted for handling certain classes of work formerly done on machine illustrated above—but with greater efficiency. Work is rotated, enabling use of both end and cross slide tools simultaneously. Air pressure is used to stop and start the spindle and to release and grip the work, thus relieving the operator from the labor of hand chucking-up and constant clutching of spindle.

SIX-SPINDLE AUTOMATIC SCREW MACHINE:

For producing parts from bar stock. Fully automatic. Its six spindles make rehandling of complicated work unnecessary and greatly increase production on simple work by the subdivision of the longer operations.

Sizes $\frac{5}{8}$, 1", $\frac{15}{8}$ " and $\frac{21}{2}$ ".

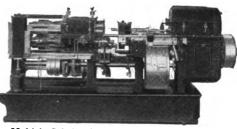
SEXTUPLE AUTOMATIC BAR MACHINE:

For blanking rolls, sleeves, pipe couplings, studs, nuts, etc., from bar stock. Six spindles. F u 1 1 y a u t o m a t i c . Designed to feed, drill, face, turn, chamfer, and cut off in all six positions, making possible productions nearly six fold those of a single-spindle automatic.

Production estimates gladly submitted.

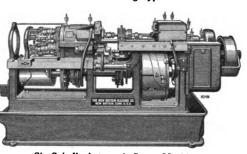


Multiple-Spindle Automatic Chucking Machine Single-Head Type

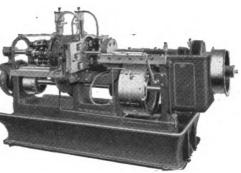


Multiple-Spindle Automatic Chucking Machine Work-Rotating Type

517



Six-Spindle Automatic Screw Machine



Sextuple Automatic Bar Machine

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THE NATIONAL ACME COMPANY

CLEVELAND, OHIO, U. S. A.

NEW YORK

Boston

CHICAGO

DRTROIT

BUFFALO

Screw Machinery, Screw Machine Products, Threading Dies and Taps

ACME MULTIPLE SPINDLE AUTO-MATIC SCREW MACHINES:

For the automatic production of duplicate parts from metal bars, in sizes up to 4" diameter, 12" long.

NAMCO AUXILIARY SCREW CHINES:

Of fully automatic and semi-automatic types are built as follows:

Stud Threaders Bolt Threaders

Single and Multiple Spindle Semi-Automatic Drilling Machines.

Screw Head Slotting Machines all are highly specialized for secondary operations.

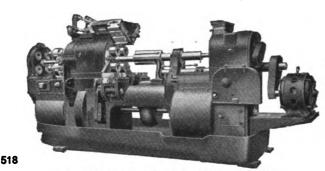
and Chaser Tool Grinding Machines.

Bar-Pointing Machines

NAMCO AUTOMATIC THREADING DIES:

For every threading requirement include Self-

Opening Dies for Hand Machines; Self-Opening and Self-Closing Die Heads for Automatic Screw Machines, Bolt Threader etc.; Adjustable Chaser Dies for heavy work; Adjustable Spring Dies.



Acme Multiple Spindle Automatic Screw Machine

Secondary operations are reduced to a minimum by the use of tools for shaving, cross drilling, end and side milling, threading, etc.

Furnished with Single Belt or Motor Drive.

NAMCO AUTOMATIC COLLAPSING TAPS:

Have positive collapsing chasers fully supported back of the cutting edge; simplicity of construction and few adjustments; wide range of work as chaser diameter is largest diameter on tap. "No hole too deep." Inside and outside trip.



Namco Automatic Threading Die

Catalogs on any of the above sent on request. Quotations made on samples or blue prints.



Nameo Automatic Collapsing Tap

THE NATIONAL ACME COMPANY

(Successors to Windsor Machine Co.)

WINDSOR, VERMONT

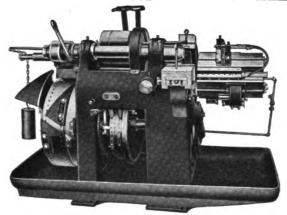
NEW YORK

Boston

CHICAGO

DETROIT

BUFFALO



The Gridley Single Spindle Automatic

GRIDLEY SINGLE AND MULTIPLE SPINDLE AUTOMATIC SCREW MACHINES:

Gridley Single and Multiple Spindle Screw Machines are fully automatic and are designed for making duplicate metal parts from bar stock.

Extreme accuracy is obtained by the rigid frame design and method of holding tools close up to their cutting points.

The simplicity of setups permits an exceptionally wide range of tooling, while the possible tool combinations reduce secondary operations to a minimum.

The Gridley Single completes, automatically, work usually accomplished on turret lathes, in sizes up to 5" diameter, while the Multiple Spindle finishes the small duplicate parts up to 25%" diameter.

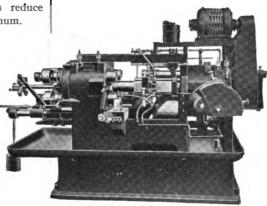
Both types are furnished with either Belt or Motor Drive.

THE GRIDLEY SINGLE SPINDLE AUTOMATIC is built in four sizes—
21/4"—31/4"—41/4"—5" and handles work up to 12" in length.

THE GRIDLEY MULTIPLE SPINDLE AUTOMATIC is built in five sizes—

 $\frac{9}{16}$ "— $\frac{1}{4}$ "— $\frac{1}{4}$ "— $\frac{1}{4}$ "— $\frac{2}{4}$ " and handles work up to 7" in length.

Complete descriptions on request.

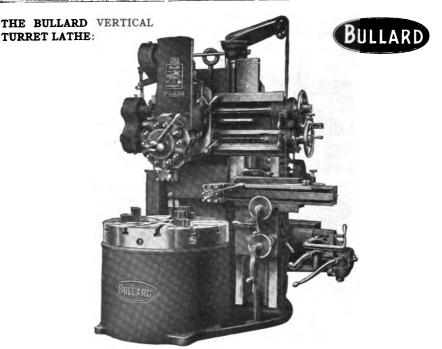


The Gridley Multiple Spindle Automatic

520

THE BULLARD MACHINE TOOL CO.

BRIDGEPORT, CONN., U. S. A.



Vertical Turret Lathe -Sizes, 24, 36, 42 and 54 Inches

Sizes: The Bullard Vertical Turret Lathe is made in 4 sizes—24-inch, 36-inch, 42-inch and 54-inch. General specifications of these machines are given below.

Machine	24"	36"	42"	54"
		90		0.
Capacity—	26"	38"	44"	56"
Diameter				
Under Crossrail	20"	24"	33"	38"
Under Tur. Face	2814"	35"	4314"	49"
Table Diameter	24 1/4"	34"	4237	50"
Table Speeds	8	12	12	12
Feed Changes-				
Both Heads	8	8	8	8
Main Head				
Vert. Movement	18"	26"	27"	27"
Will Face	26"	38"	44"	56"
Main Turret-				
Diameter	14"	15!4"	163/4"	16% "
Side Head-		- / -	<i>,</i> -	
Vert. Movement	18"	19"	28"	31"
Horiz, Movement	14 16"	20"	21"	21"
Weight-Net	9000	14000	18500	23000
Motor 7		10 hp.	15 hp.	

Adaptability: Widely adaptable and extremely durable, the Bullard Vertical Turret Lathe may be kept in continuous operation—producing.

Two tool heads, one main and one side, are universal in their movement and ad-

justment throughout the entire range of the machine, thus simplifying the tool equipment required for a wide range and variety of work: the same tools, excepting reamers, etc., are equally adaptable to the smallest and largest pieces of the same class.

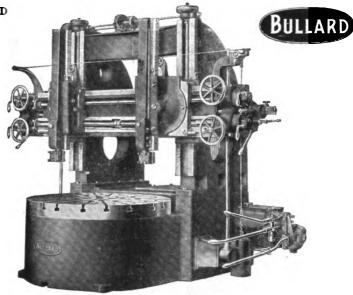
By means of accurately graduated scales and micrometer dials, and adjustable "Observation Stops" mounted thereon, tools are readily set and sizes obtained and maintained.

Convenient, certain and positive control, without complication, with each unit developed for the maximum service required thereof, and with a due and intelligent regard for the completed whole, results in quality intensive production.

Our book "Cutting Time between Cuts" tells the story in a general way. For detailed information on your work, we place at your command the services of our Engineering Department. No obligation,

THE BULLARD MACHINE TOOL CO.





Maxi-Mill-Sizes, 44, 54 and 61 Inches

521

Sizes:

The Bullard Maxi-Mill is made in three sizes—44-inch, 54-inch and 61-inch. The general specifications of these machines are given below.

Machine	44"	54"	61"
Capacity-Diameter	48"	56"	63"
Under Crossrail	34"	43"	52"
Under Toolholders	34"	43"	52"
Table Diameter	4234"	50"	61"
Table Speeds	12	12"	12
Feed Changes-			
Both Heads	8	8	8
Tool Slides-			
Vertical Movement	36"	36"	36"
Weight-Net	20000	23000	28000
Motor Drive	15 hp.	15 hp.	15 hp.

Adaptability:

This machine represents the maximum possibilities of the Vertical Boring and Turning Mill based upon a knowledge of the requirements gained by extensive observation and a specialized experience as makers and users thereof. In design

and materials of construction this machine is purposed to withstand the most severe usage continuously with a minimum of maintenance cost.

Like the Bullard Vertical Turret Lathe, it is equipped with certain, positive and convenient control, hammer hand wheels, continuous flow lubrication, graduated scales, micrometer dials, observation stops for the duplication of sizes and the table may be started and stopped from either side of the machine.

For production data on this machine, consult our Engineering Department, the services of which are at your command without obligation.

Descriptive circulars will be sent for the request.

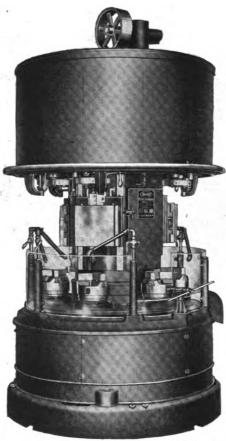
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THE BULLARD MACHINE TOOL CO.

BRIDGEPORT, CONN., U. S. A.

THE BULLARD MULT-AU-MATIC:



BULLARD

522

8-Inch and 12-Inch

The field of the Mult-Au-Matic includes all classes of castings, forgings or bar-stock sections, cut to lengths, coming within its capacity, and which require boring, turning, facing, or threading operations, either singly or in combination.

In comparison with any other method of producing an equivalent output of this class of work, the Bullard Mult-Au-Matic

WILL SAVE 4/s to 9/10 in labor cost
BECAUSE men, in proportion, are
released for other work

released for other work.

WILL SAVE 4/8 to 9/10 in floor space
BECAUSE it is six machines in one,
automatically and mechanically coordinated—and vertical.

ordinated—and vertical.

WILL SAVE 3/2 to 3/4 in tool equipment
BECAUSE it requires but one simple

set for the six machines combined in one—and these may be conserved by timing all operations, long or short to complete simultaneously.

WILL SAVE in original investment BECAUSE floor space, other machines, tools and related equipment for equal output cost more.

WILL SAVE overhead expense
BECAUSE it requires less investment, less floor space, fewer men,
less power, smaller tool renewal,
and lower maintenance charges.

The preceding statements are based on actual performance. Let us prove them on your work. The services of our Engineering Department are at your command, without obligation.

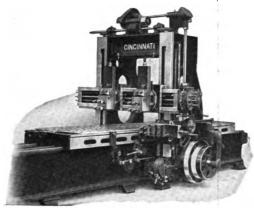
Descriptive literature, giving specifications and compelling production facts, for the request.

THE CINCINNATI PLANER CO.

OAKLEY, CINCINNATI, OHIO

Manufacturers of Planers and Boring Mills

The modern machine tool is one in which all proven time and labor saving devices are incorporated.



CINCINNATI PLANERS, both double housing and open side types, are designed for speed variation, power, rigidity, durability, convenience in operation and adaptability for all classes of work required of a Planer. These machines are regularly furnished with the following improvements which have been recognized as a necessity and furnished on larger and more expensive machines for a number of years.

Patent Tu-Speed Drive.

Rapid Power Traverse to the rail heads. Forced Lubrication to the vees.

Herringbone Gears (for first reduction train).

Variable Speeds: All CINCINNATI Planers from 22" to 56" inclusive are regularly furnished with a Patent Tu-Speed Drive giving two cutting speeds with a constant return. If it is desired, any Planer can be arranged for motor drive.

Sizes: Double Housing Planers are made in sizes from 22" to 120".

Open Side Planers are made in sizes from 30" to 72".

CINCINNATI BORING MILLS are time saving efficiency tools for efficient boring and turning. They are accurate, convenient, speedy machines that give excellent

service at all times. As in CINCINNATI Planers, every time and labor saving device that will increase the output and

decrease manual labor expended on the machine is incorporated in it, among which are:

Rapid Power Traverse to rail heads.

Interlocking hand and power feed with the Rapid Power Traverse.

Sensitive adjustment to the heads.

Rail Clamped both inside and outside of the housing face.

Sizes: These mills are made in sizes from 36 inches to 12 feet and can be arranged for 523 either belt or motor drive.

Our facilities for building a very high grade product are unexcelled. system of inspecting each piece before allowing it to proceed to the next department assures accuracy of every detail. We have a complete equipment jigs and fixtures which insures



all parts being made interchangeable. Each machine is required to show within the limit of error and is tested under actual operating conditions before shipping.

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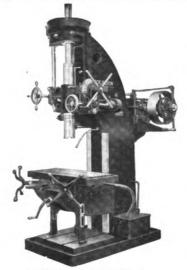
COLBURN MACHINE TOOL CO.

CLEVELAND, OHIO, U. S. A.

Heavy Duty Drill Presses-Vertical Boring and Turning Mills

COLBURN D-TYPE HEAVY DUTY DRILL PRESSES:

Designed primarily to meet the exacting demands of Heavy Duty Drilling, tapping, boring, reaming, facing, under-



D8 Heavy Duty Drill Press

524

cutting, counterboring, trepanning, and like operations.

The size here illustrated has a drilling capacity to the full cutting edge of a 5 inch high speed drill in solid steel. Gears are heat-treated and hardened, and run continuously in a bath of oil. Shaft journals in speed box are equipped with combined radial and thrust ball bearings. The spindle is forged high carbon steel of extra large dimensions, double splined, thus equalizing the excessive strain exerted on the sides of the keys when driving large drills and boring tools. The spindle thrust is taken by self-aligning ball bearings. All levers are located at front of machine within easy reach of the operator. Furnished with plain or compound table. Equipped with tapping attachment and tapping hood for extra heavy tapping if desired.

Built in three sizes:

D4-24" swing-31/2" drilling capacity.

D6—36" swing—3½" drilling capacity.

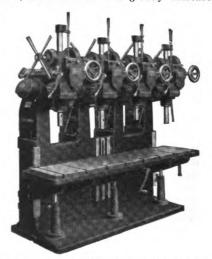
D8-36" swing-5" drilling capacity.

COLBURN MANUFACTURING TYPE HEAVY DUTY DRILL PRESS:

This manufacturing drill press, while originally designed as a single purpose machine for drilling large quantities of duplicate parts, has an ingenious patented device which gives practically an unlimited range of speeds and feeds thus greatly enlarging its field of usefulness.

Built with one, two, three, or four spindles to suit requirements.

If you have duplicate pieces to drill, ream, tap, counterbore, face, undercut, etc., this machine will greatly increase



Four Spindle No. 2 Manufacturing Drill Press

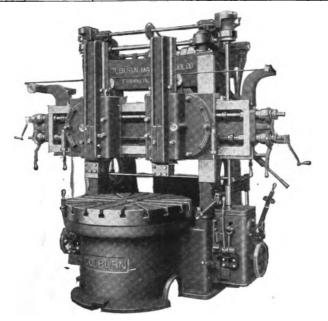
your production and reduce your manufacturing costs.

Bulletins illustrate and describe the various sizes we build,

COLBURN MACHINE TOOL CO.

CLEVELAND, OHIO, U. S. A.

Vertical Boring and Turning Mills-Heavy Duty Drill Presses



525

Colburn 48" Boring and Turning Mill

COLBURN VERTICAL BORING AND TURNING MILLS:

To obtain maximum production, likewise minimum shop cost, on a Vertical Boring and Turning Mill, it is essential that the machine be of staunch and sturdy build and have powerful drive and feed mechanism, massive cross rail, heads, table, etc. It must also at all times be under the quick and easy control of the operator.

The Colburn meets fully these essential requirements. Speed and feed changes are readily made. Controlling levers are located at the front of the machine and duplicated at either side.

The operator does not move from his regular working position in making changes.

Power rapid traverse is provided for the heads, always reversing the direction in which the tool may be feeding. This avoids any possibility of damaging the work.

A brake quickly stops the table at any predetermined point. Driving gears run in a bath of oil. There are many other interesting details.

Built in six sizes: 36, 42, 48, 54, 60 and 72 inch swing.

Let us send our complete catalog, or bulletins of any size you are interested in.

T. C. DILL MACHINE COMPANY, INC.

PHILADELPHIA, PA., U. S. A.

Builders of Slotters

THE "DILL SLOTTER:"

In the design of the "Dill Slotter," to meet the demands to today, it was plain that a departure was necessary and that procedure must be in at least two directions: First, that the machine must be able to produce a greater amount of work and that work must be more accurate. Second, that it must have a much greater range and not be confined only to the ordinary slotter work, but also reach out into other fields of usefulness; and, besides all this, it must be, if possible, more durable. The following features, which for the most part are exclusive, show how this Slotter meets the above requirements.

The GENERAL CONSTRUCTION of the "Dill Slotter" throughout is such as to insure efficiency and durability. It is constructed of the best material for the purpose; the gears are all cut from solid metal and mostly of forged steel; flat bearing surfaces are all hand-scraped to surface plates and are of ample dimensions. Gears, shafts, etc.. are readily accessible for inspection. The convenience of operation is of special merit; while it is operative from one point principally, hand feeds are provided on all sides.

Attributes:

A Traveling Head—Greatly increases the range of the machine.
A Quick Traverse Gear—A great time and labor

saver.

New Quick Return—Permits high and uniform cutting speeds.

cutting speeds.

New Intermittent Feed—For feeding heavy work at high speeds.

An Automatic Knock-Off—A safety device for the feed mechanism.

A Stroke Indicator—Quite indispensable; nothing like it.

A Hand Wheel Controller—A good thing, and

in the right place.
A Tool Post in the Relief Apron—Very handy in changing tools.
Six Changes of Speed—About four is the usual

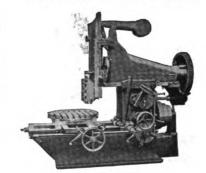
number.

Belt and Motor Driven—Designed for both; not a make-shift.

Powerfully Geared—About double the usual

ratio.

15 Inch Slotter. Belt or Motor Driven



Arranged for Belt Drive

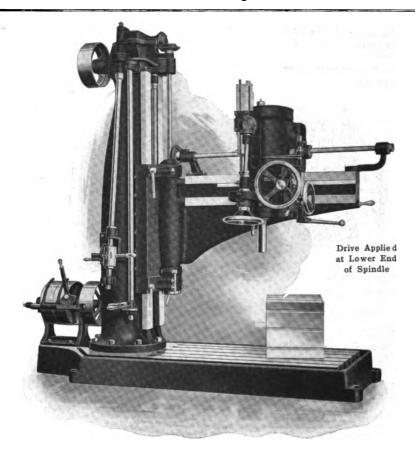
PRINCIPAL DIMENSIONS

Size of machine, in	10	10-12	1 15	15-18	1 20	20-24
Maximum stroke, in	101/2	121/2	151/2	181/2	21	25
Longitudinal movement of table, in	28	28	36	36	48	48
Transverse movement of table, in	20	20	30	30	40	40
Diameter of table, in	24	24	34	34	44	44
Movement of head, in	15	15	20	20	30	30
From table to head, in	12	12	191/4	191/4	241/2	241/2
Adjustment of ram, in	16	16	23	23	32	32
Will cut to the center of circle of	54 in.	54 in.	72 in.	72 in.	92 in.	92 in.
Will cut to outside of circle of	54 in.	54 in.	90 in.	90 in.	108 in.	108 in.
Strokes of ram per minute, r. p. m	111/2-85	10-76	8-48	7-43	6-31	51/2-27
Feed of table per stroke, in	0.011	0.011	0.010	0.010	0.0069	0.0069
	to 0.154	to 0.154	to 0.187	to 0.187	to 0.138	to 0.138
Circular feed per stroke at 12 in. dia. (in.)	0.0187	0.0187	0.011	0.011	0.0055	0.0055
	to 0.261	to 0.261	to 0.196	to 0.196		
Feed of head per stroke, in	0.0055		0.005		0.00345	
	to 0.077	to 0.077	to 0.093	to 0.093	to 0.069	to 0.069
Ratio of gears from cone pulley shaft	12 to 1	12 to 1	18 to 1	18 to 1	24 to 1	24 to 1
Size of countershaft pulley, in	14 x 3 1/2	14 x 3 1/2	20 x 4	20 x 4	26 x 5	26 x 5
Speed of countershaft, r. p. m	200	180	200	180	200	180
Horsepower of motor	3	3	5	5	10	10
Speed of constant speed motor, r. p. m	1,200	1,000	1,200	1,000	1,200	1,000
Speed of adjustable speed motor, r. p. m	400 to	400 to	400 to	400 to	400 to	400 to
	1,200	1,200	1,200	1,200	1,200	1,200
Net weight, lbs	5,750	6,000	11,000	11,500	25,000	26,000
Code word	Ummoj	Ummuk	Ummyl	Umnag	Umneh	Umnij

WESTERN MACHINE TOOL WORKS

HOLLAND, MICHIGAN, U. S. A.

Manufacturers of Low-Hung Drive, High Power Plain and Full Universal Radial Drilling Machines



WESTERN RADIAL DRILLS:

The improved Western Radial incorporates all of the best features that modern practice and our twenty years of experience manufacturing Radial Drills has proven to us to be necessary and desirable in a machine which must stand up continuously under the tremendous stresses created by the modern methods of drilling.

The Western Radial is an exceptionally powerful and rigid machine. It is particularly qualified as a rapid drilling and tapping machine.

The principle of the "Low-Hung-Drive" on the lower end of the drill spindle is mechanically correct and is so far superior to the method of spindle drive used on all other makes of radial drills that, on any class of work upon which a radial is called upon to perform, this important exclusive "Western Radial" feature alone, should convince the most skeptical of the superiority of this tool.

All hand levers are conveniently located, and are within easy reach of the operator. In fact, careful attention has been given to the arrangement of all the various units to insure ease of manipulation, compactness and simplicity. There are many valuable features which have been embodied in the design of this machine which heretofore have not been incorporated in other machines of like character.

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527

NILES-BEMENT-POND COMPANY

GENERAL OFFICES, 111 BROADWAY, NEW YORK

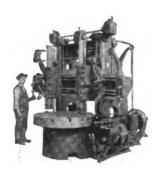
BOSTON
PHILADELPHIA
BIRMINGHAM
ROCHESTER
PITTSBURGH

CLEVELAND CINCINNATI DETROIT CHICAGO ST. LOUIS

ST. PAUL LOS ANGELES SAN FRANCISCO SEATTLE LONDON

Manufacturers of Steam Hammers, Electric Traveling Cranes and Complete Machine Tool Equipments for General Machine Shops, Railroad Shops, Ship and Navy Yards and Heavy Ordnance or Small Arms Arsenals

MACHINE TOOLS:



528 We build heavy machine tool equipment for shops of every size.

For railroad manufacturing and repair shops.

For general manufacturing.

For shipyards, dry docks and Navy yards.

For Small Arms Arsenals, Gun and Projectile manufacturing plants.

These machines are representative of the best practice in tool construction. They include lathes planers, boring mills,



slotters, drilling machines, milling machines, shapers, boring and drilling machines, boring, drilling and milling machines, shears, punches and presses, etc.

STEAM HAMMERS:

Bement Steam Hammers are b u i l t in single-frame, double-frame and drop-hammer types. They are entirely dependable and are so designed that with very little attention they can be



operated continuously without breakdowns. In their construction only the best material and workmanship are used.

TRAVELING CRANES:

We build various types of Electric Traveling Cranes, trolleys and hoists. They are designed to obtain the highest operating efficiency with the lowest cost of maintenance. We are at all times ready to aid you in the solution of your handling problems.



Catalogues, Circulars and Full Information on request.



PRATT & WHITNEY COMPANY

GENERAL OFFICES, 111 BROADWAY, NEW YORK

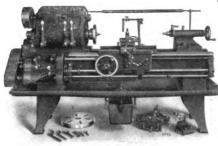
WORKS: HARTFORD, CONN.

Boston Philadelphia Birmingham Rochester Warehouse Stocks in CLEVELAND CINCINNATI DETROIT CHICAGO ST. LOUIS

ST. PAUL LOS ANGELES SAN FRANCISCO SEATTLE LONDON

Manufacturers of Precision Machine Tools, Small Tools, Gages and Standards, Hoke Precision Gages, P. & W. Measuring Machine, also Builders of Jigs and Fixtures and Special Manufacturing Equipment. Complete Equipments for Small Arms Arsenals

PRECISION MACHINE TOOLS:



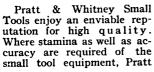
& Whitney tools have more than held their own. We can honestly recommend them—our line is complete. They include taps, dies reamers, milling cutters, punches, drills, special tools, etc.

GAGES AND STANDARDS:

Recent developments in Pratt & Whitney Gage manufacture are the Hoke Precision Gages, "Mike-checks," Tool-

As originators of the system of interchangeable manufacture, Pratt & Whitney Company have developed a line of Precision Machine Tools unequalled for accuracy and refinement. They include Bench, Engine and Turret Lathes, Hand Screw Machines. Hand and Power Milling Machines, Die Sinkers, Sensitive and Multiple Spindle Drills, Vertical Surface Grinders, etc. Special and original with us are Automatic Milling Machines, Horizontal Automatic Profiling and Cam Cutting Machines, Vertical Shapers, Jig Machines, Contour Cutter Boring Grinder, Thread Miller and Spline Miller.

SMALL TOOLS:









makers' Flats. By means of the Hoke Precision Gages accurate measurement to within five millionths of an inch is made possible and guaranteed. We also supply a full line of standard Thread Gages, Plug and Template Gages, Snap Gages, M. C. B. Gages for railroad use, as well as special gages for multiple manufacturing.

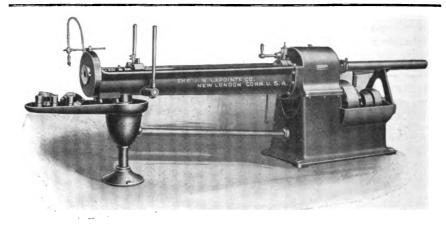
Catalogues, Circulars and Full Information on Request.

529

THE J. N. LAPOINTE CO.

NEW LONDON, CONN.

Manufacturers of Broaching Machines and Broaches



No. 3B Broaching Machine. Code Word—Standard.

One of 11 types and 5 sizes made by the J. N. Lapointe Co.

530 SPECIFICATIONS:

Capacity: Cutterbars15% wide
 Square broaches3¼" square
Stroke56"
Driving screw
Length of drawing nut11"
Cutting speed4' 6" per minute
Hole in faceplate5" diameter
Vertical adjustment of drawhead31/4"
T. & L. counter pulleys18" diameter
Counter speed
Driving pulley on machine18" diameter
Floor space
Net weight3100 lbs.
Gross weight, domestic 3470 lbs.
Size of motor8 H. P.
Speed of motor1000 R. P. M.

Standard equipment:

Reducing bushings	1½", 2", 2½"
Pull bushings	1/2", 5/8", 3/4", 1"
Gross weight, export	3930 lbs.
Size of box, export	180" x 49" x 29"

The No. 3B machine is also made as a double machine, with two screws each with the usual working head. In operation, one head is on the cutting stroke, while the other is returning. Thus no time is lost—an advantage with large quantities of duplicate work.

No other machine shop operation has extended in use, relatively, so rapidly during recent years as has broaching—due to increasing knowledge of its adaptability to a wide range of work and its surprising economy in production time and costs.

The improvements in broaching machines and broaches—largely the direct result of years of experience and effort of a few men—have brought broaching to a point where it is now considered indispensable on certain classes of work.

Since broaching to exact size does not depend on the skill of the operator—which need be only sufficient to run the machine—quality as well as quantity of work is attained. Thus broaching simplifies at once the problems of labor and increased production.

Broaching machines and modern broaching practice are interestingly discussed in the J. N. Lapointe Co. catalog—which will be mailed upon request,

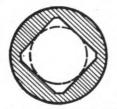
THE LAPOINTE MACHINE TOOL CO.

HUDSON, MASSACHUSETTS, U. S. A.

Manufacturers of Machines and Tools for Broaching

LAPOINTE BROACHING MACHINES

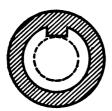
are made in four different sizes, No. 1, No. 2, No. 3, and No. 4. Any size can be arranged for motor drive either direct connected or silent chain drive. These machines are designed for strength, rigidity, durability, convenience of operation, and adaptability for all classes of work required of a Broaching Machine.



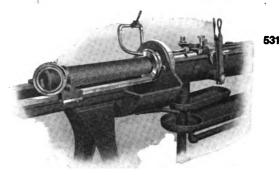
From Round to Square in Less than One Minute



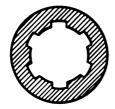
No. 4 Machine: Capacity to cut keyways 4" wide or broach square holes in steel up to 4" across flats from a drilled hole



From Round to Solid Key in Less than Two Minutes



Broaching Two 5" x 1/4" Steel Internal Gears in One Minute



From Round to Six Spline in Less than One Minute

The small machines are used for cutting single keyways and broaching small square holes or any other broaching work within their capacity. The larger machines are used extensively for broaching multiple spline holes, Internal Gears, large square, hexagon and rectangular holes, also for sizing round holes up to 5° in diameter.

The manufacture of broaching tools is a specialty that requires not only expert toolmakers but a great many special machines, together with all the modern appliances for hardening, tempering, and straightening broaches. We are the pioneers in this industry and our product is the result of nearly twenty years' experience. Every broach is tested for strength and accuracy before being shipped.

The oldest and largest company in the world manufacturing Broaching Machines and Broaching Tools exclusively.

THE FELLOWS GEAR SHAPER CO.

SPRINGFIELD, VERMONT, U. S. A.

Sole Makers of Fellows Gear Shapers and Gear Shaper Cutters

THE FELLOWS SPUR GEAR SHAPER:

The Fellows Spur Gear Shaper is a gear-generating machine designed especially for the economic and accurate production of spur external, internal, shoulder or cluster gears.

NO. 61 FELLOWS GEAR SHAPER:

The Spur Gear Shaper is made in a variety of types to accommodate various classes of work. The No. 61 Gear Shaper has a capacity for cutting external spur gears having a pitch diameter of 35", 4 diametral pitch and 5" face, and internal spur gears having a pitch diameter of 25", 4 diametral pitch and 3" face.

This machine is adapted to hold shank gears. Gears having a shank diameter of from $2\frac{1}{4}$ to $2\frac{1}{6}$, depending on the design, can be satisfactorily held. It is also provided with an adapter for the workspindle, so that standard work-arbors can be used.

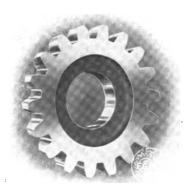
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NO. 62 FELLOWS GEAR SHAPER:

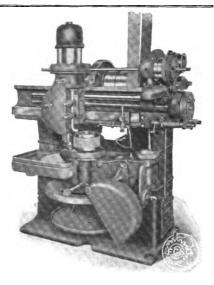
The No. 62 Gear Shaper is designed especially for the cutting of coarse pitch gears. It carries Gear Shaper cutters having a hole 1¾" instead of 1¼" in diameter, as is the case with the No. 61.

NO. 612 FELLOWS GEAR SHAPER:

The No. 612 Gear Shaper is a combination of the Nos. 61 and 62 machines, having both a large work-spindle and a large cutter-spindle.



Fellows Spur Gear Shaper Cutter



No. 61 Fellows Spur Gear Shaper

NO. 64 FELLOWS GEAR SHAPER:

The No. 64 Gear Shaper is a machine designed especially for cutting gears having large shanks. It has a hole through the work-spindle to accommodate a shank 5" in diameter, and is provided with the standard cutter-spindle.

NO. 624 FELLOWS GEAR SHAPER:

This is a combination of the Nos. 62 and 64 machines having a work-spindle of large diameter—capacity for 5" shanks—and a large cutter-spindle carrying cutters having 13%" hole. This machine is used in connection with machine tool plants for cutting quill gears and similar work.

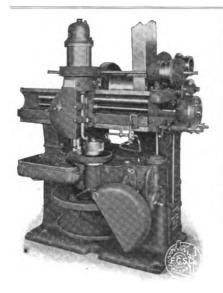
THE GEAR SHAPER CUTTER:

The Gear Shaper Cutter is a high production tool, and in addition produces an extremely fine finish on the gear tooth, owing to the peculiar action of the cutter as it rolls in mesh with the gear it is cutting. It, therefore, possesses all of the necessary features for an accurate and economical method of cutting gears. The principle of the Gear Shaper Cutter can also be applied to a variety of other shapes. Those interested in the generating of accurate work are requested to send for our literature covering this subject.

THE FELLOWS GEAR SHAPER CO.

SPRINGFIELD, VERMONT, U. S. A.

Sole Makers of Fellows Gear Shapers and Gear Shaper Cutters



No. 65 Fellows Helical Gear Shaper

THE FELLOWS HELICAL GEAR SHAPER:

The helical gear is considered as being a more efficient gear than a spur gear when properly cut, and for this reason it is recommended where quiet and efficient operating gears are demanded.

The two features of a helical gear that require considerable attention are accuracy of tooth outline and uniformity of helix angle. Two meshing gears, for instance, must have exactly the same helix angle or they will not operate properly together.

In the Fellows Helical Gear Shaper these two points are controlled in the fol-lowing manner. The accuracy of the involute tooth outline of the gear is controlled by a cutter which is ground all over after hardening, removing all possible distortion. The uniformity of the helix angle is controlled by positive heli-cal guides having the same helix angle as that of the cutter. These guides are made right- and left-hand, as is also the case with the cutters.

NO. 65 FELLOWS HELICAL GEAR SHAPER:

This is the standard size of Helical

Gear Shaper and has a capacity for cutting external helical gears of 26" pitch diameter, 5" face, $^{5}/_{7}$ diametral pitch, and internal helical gears 24" pitch diameter, 3" face and $^{5}/_{7}$ diametral pitch. The cutters used have holes 11/4" in diameter.

NO. 615 FELLOWS HELICAL GEAR SHAPER:

The No. 615 Gear Shaper is a combination of the Nos. 61 and 65 machines.

NO. 645 FELLOWS HELICAL GEAR SHAPER:

This machine is a combination of the Nos. 64 and 65 machines having a large work-spindle, which has a capacity for shank gears 5" in diameter. It is recommended especially for the cutting of herringbone and helical gears for reduction mechanisms.

LITERATURE ON GEARING:

The Fellows Gear Shaper Company, 533 appreciating the necessity for accurate and reliable literature on the subject of gear cutting, has published a series of booklets



Right- and Left-Hand Helical Gear Shaper

dealing with various phases of gear design and gear cutting. A few of the titles are: "Commercial Gear Cutting"

"The Involute Gear" "The Stub Tooth Gear"

"The Helical Gear' "The Internal Gear"

These booklets will be gladly sent to any address upon request.

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OURADVIS IN MECHANICAL

ENGINEERING

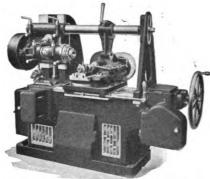
BARBER-COLMAN COMPANY

ROCKFORD, ILL., U. S. A.

Manufacturers of Hobbing Machines and Hobs

BARBER-COLMAN HOBBING MACHINES:

The Barber-Colman Hobbing Machines are generating machines for producing Spur and Spiral gears, Sprockets (roller, block and silent chain types), Ratchets and Spline Shafts.



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No. 12 Barber-Colman Hobbing Machine

B-C Hobbing Machines are designed primarily as high production machines to meet the demands for accurately finished work combined with high rate of production. They are made in three sizes designated as No. 2, 3 and 12.

No. 12 B-C Hobbing Machine: This size has a capacity of 12" diameter and 10" width of face; cutting gears of 3 diametral pitch and finer in cast iron and 4 diametral pitch and finer in steel. Hole through work spindle $1\frac{17}{12}$ " enlarged to No. 12 B & S taper at the front end.

No. 3 B-C Hobbing Machine: This size has a capacity of 5" diameter and 7" width of face; cutting gears of 12 diametral pitch and finer in either cast iron or steel. Hole through work spindle \frac{32}{32}" enlarged to No. 9 B & S taper at the front end.

No. 2 B-C Hobbing Machine: This size has a capacity of 3" diameter and 7" width of face; cutting gears of 24 diametral pitch and finer in either cast iron or steel. Hole through work spindle \frac{32"}{22"} enlarged to No. 9 B & S taper at the front end.

HOBBING SPLINE SHAFTS:

The B-C Hobbing Machines can be equipped with special equipment to accommodate work of various types and design. With the use of a Draw-in

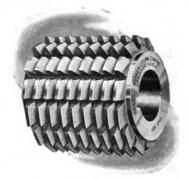
Collet Chuck or Floating Chuck there is provided a means for holding shafts to be splined, of various lengths.

For hobbing shafts of extra large diameter special work spindles can be furnished with enlarged hole through the spindle. Shafts of unusual length can be accommodated by equipping machine with a special overhanging arm carrying a rear bracket and center.

VERTICAL FEED ATTACHMENT:

For generating Worm Gears and similar forms, which cannot be cut by feeding the hob horizontally across the work, a Vertical Feed Attachment can be furnished. When using this attachment the hob slide is stationary and the work is automatically fed into the hob.

This attachment particularly adapts itself to the cutting of spiral gear teeth on cam shafts.



Ground Gear Hob

BARBER-COLMAN HOBS:

Barber-Colman Hobs are made on specially constructed machines, designed and built in our own plant. The greatest care is taken in the selection of the steel from which they are made, and careful scientific heat treatment is given to get the best possible cutting quality at high production speeds.

Formed Hobs give results satisfactory for ordinary requirements. Where extreme accuracy and absolute uniformity are required we recommend Ground Hobs, that is, hobs with the sides and tops of the teeth ground after hardening. This gives a hob that is correct as to form and size.

B-C Hobs can be furnished for every use

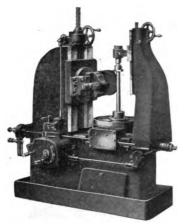
B-C Hobs can be furnished for every use that hobs can be put to and for any machine.

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THE HERCULES MACHINE & TOOL COMPANY, INC.

SALES OFFICE Broome and Lafayette Streets, New York

WORKS Astoria. L. I., N. Y.



The Twenty-four Inch Hercules Gear Hobber, with a capacity up to gears of 28-inch outer diameter and 12 inch face, is developed particularly to meet the demand for cheap and intensive manufacture of gears for automobile and tractor transmissions, change gears, machine tool drives, and the numerous gears of medium size used in the construction of commercial mechanisms of one kind or another.

Regular Equipment:

1 hob arbor, ¾" in diameter
1 work arbor, ¾" in diameter
1 set of change gears
1 set of change feed gears Wrenches, chart

FUNDAMENTAL PRINCIPLES:

Standard spur and spiral gears, to be interchangeable and capable of precise adjustment, are proportioned according to the well known involute system of gearing, which in its simplest form is represented by plain rack with teeth of streightline profile. All gears to be truly interchangeable must have teeth proportioned so as to mesh accurately with the teeth of such a rack and to operate without interference. In this way only can the limitation inherent to the involute system of gearing, "involute interference," be avoided, and efficient and effective gear-

ing secured.

The accuracy of the simple "rack space" cutting tool is possessed by the involute gear hob cutter, for it is to all intents and purposes a spiral, circular rack with cutting teeth which machine the tooth spaces of an advancing gear



The Eight-Inch Hercules Gear Hobber is adapted to the generation of all precise spur, spiral and worm gears up to a maximum outer diameter of 8-inch and an extreme face of 6-inch, diameter of 8-inch and an extreme face of 0-inch, and is designed especially for the rapid and economical production of the accurate, small gears required in the construction of high grade typewriters, adding machines, phonographs, moving picture apparatus, speedometers magnetos, timing gears and other mechanisms of mechanical refinement.

Regular Equipment:

1 hob arbor, ¾" in diameter
1 work arbor, ¾" in diameter
1 set of change gears
1 set of change feed gears Wrenches, chart

would take place if a plastic gear blank were caused to roll upon an accurately proportioned and rigid rack of true involute form.

Precise gear hobbing produces gear teeth of involute form, free from profile modifications, involute interference and backlash. Gears are generated which mesh accurately with standard involute racks and are thus truly interchangeable. The requirements for efficient and effective gearing possessing long life are assured.

Standard Size Hobs in Stock at all Times. Special and Ground Hobs to

Hercules Gear Hobbers are manufactured in the above two sizes and in the future, we will build a 48" machine with a capacity of 56" diameter and 24" face. blank with a result similar to that which | Larger machines will be built to order.

THE BILTON MACHINE TOOL CO.

BRIDGEPORT, CONN., U. S. A.

Manufacturers of Automatic Gear Milling Machines, Gear Hobbing Machines, Automatic Milling Machines, Automatic Slitting Machines for Knitting Machine Trade, Plain and Ball Bearing Sensitive Drill Presses, Plain Milling Machines, Riveting Machines

AUTOMATIC MACHINES:

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GEAR

MILLING



Made in 3 sizes for spur or bevel gears.

No. 1 1½	4" dia.	14 pitch
No. 2 2½	6" dia.	10 pitch
No. 31/2	8" dia.	8 pitch

These machines can be adapted to a large variety of special form milling which can only be done to advantage on these machines. Used on milling cutters, reamers, taps, cylinders, also small worms with attachment.

Our catalogue No. 15 shows what can be accomplished.

SPECIAL FEATURES:

Entirely automatic action.

Positive and direct indexing to the work.

Cutter clears work while indexing.

Quick releasing fixture for removing work.

Large production through quick action of machine.

Exceptional wide range of usefulness.



The above sizes are also made in vertical type used for milling and slotting sinker rings, dials. plates, milling cutters. Range up to 18" dia.

UNIVERSAL GEAR HOBBING MACHINES:



Capacity:

Diam.	Pitch	Width of Face	Weight	
10"	10	10"	2000 lbs.	

Will automatically hob spur spiral gears, worms and worm gears, also variety of special shapes.

Base and oil pan extra heavy with liberal reinforcements to absorb vibration. Work table driven by large bronze worm gear and worm and automatically lubricated. Machine uses least possible number of feed and index gears. Hob spindle bored for No. 9 B & S Taper, driven by Helical gear 8-10 pitch. Machine entirely of latest design with new feature to increase production without sacrificing accuracy.

Send for catalogue.

Plain Horizontal Knee and Column Type Milling Machines, 27" x 8" x 18", weight 1900 lbs.

High Speed Ball Bearing Drill Press, 78" capacity, 4 and 6 spindle.

Automatic Cam Feed Drill Press,

1/2" capacity, weight 1800 lbs.

MILL-IT-AUTOMATIC Machines for automatic milling. FOREIGN AGENTS: Chas.

Churchill Co., Alfred Herbert, M. Mett Eng. Co.

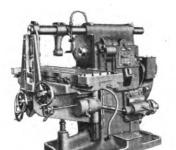


BROWN & SHARPE MFG. CO.

PROVIDENCE, R. I., U. S. A.

Machine Tools—Small Tools—Cutters

MILLING MACHINES:



Universal, Plain and Vertical ranging from light Hand Milling Machines to the Heavy Service Type. One of the line is a fully Automatic Milling Machine.

MILLING CUTTERS:

A complete line of over 3,000 sizes, including Hobs and Gear Cutters. Special Cutters and Hobs made to order.

GRINDING MACHINES:



Universal, Plain, Surface, Tool and Cutter. This range meets the demand from the manufacturing floor to the tool room,

BS

SCREW MACHINES:



Plain, Wire Feed and Automatic for the manufacture of duplicate parts in large quantities.

AUTOMATIC MACHINES:

GEAR

CUTTING

537



Spur and Bevel. A range greater than the ordinary demands require. Spur Gears to 72" diameter; Bevel Gears to 24" diameter.

MACHINISTS' TOOLS:

A complete line for operator, toolmaker, machinist or toolroom. Over 1,000 varieties.

Catalog on Request,

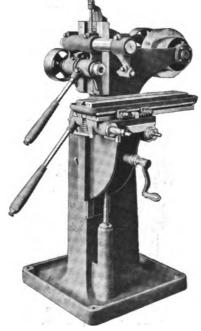
THE BRISTOL MACHINE TOOL CO.

BRISTOL, CONN.

Manufacturer of Hand and Vertical Milling Machines, Piston Ring Grinders,
Precision Surface Grinders



This trade mark on a machine means that "Quality First" is the basis of its manufacture. Nothing but the best of materials are used—suited chemically and physically for the task they must perform. The raw materials are wrought to their final state by skilled mechanics and when the finished product is delivered to you this mark means you have the best.



538

Standard Type Hand Miller

BRISTOL HAND MILLING MACHINE:

Made also in Heavy Type belt driven, Heavy Type back geared spindle and Power Feed Table Type.

These machines give excellent service when used for keyseating, gear and sprocket cutting, slotting, straddle milling, cam cutting and similar classes of work, especially in the manufacture of small parts where accurate duplication is essential.

For this class of work these machines are best since any other of the larger millers

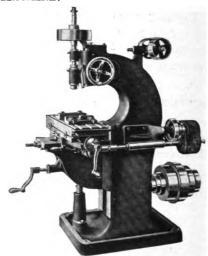
are an expense and needless liability. The controls are all arranged conveniently. The flexibility of manipulation is evidenced on profiling jobs when the spindle may be brought close to the

the spindle may be brought close to the table and the work guided by the independent vertical and horizontal feeds.

Made in three sizes or types: No. 0 (illustrated), the standard machine; No.

Made in three sizes or types: No. 0 (illustrated), the standard machine; No. 1, a heavy type designed for use on work requiring a heavier machine than the standard; No. 2, a heavy type designed for heavy cuts and equipped with back geared spindle of planetary type giving two speeds to spindle without change of pulleys

BRISTOL VERTICAL MILLING MACHINE:



10" x 28" Belt Driven with Plain Vise Jaws

Also made with a Rotary Table. The painstaking workmanship and selected material, coupled with ball bearings and belt drive, assure the purchaser an extra smooth finish upon the work turned out. These machines are generously designed, enabling heavy cuts to be taken with cool running bearings.

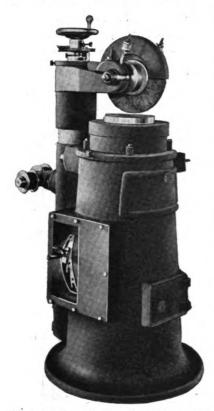
This machine gives excellent results when die-sinking, profiling, circular milling and segmental milling.

Our machines pass an inspection and test that approaches scientific perfection as close as the work of any modern manufactory.

539

THE BRISTOL MACHINE TOOL CO.

BRISTOL PRECISION GRINDERS:



8" Ring Grinder with Magnetic Chuck especially adapted to the rapid production of Piston Rings

These grinders are made in several types and sizes and are equipped with 8", 12" and 16" magnetic chucks.

For accuracy and rapid grinding of flat surfaces the rotating magnetic chuck gives the best service. Pieces may be ground singly or in multiples within the capacity of the chuck.

The new Bristol Precision Rotary Surface Grinders are constructed along simple lines with several distinctive features incorporated. The wheel spindle is mounted on a movable head attached to a very rigid column which is supported in a long housing on the back of the frame.

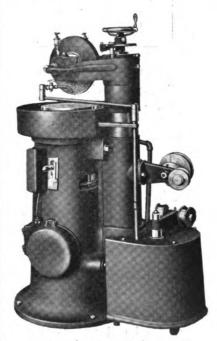
Dirt and grit are kept out of all bearing surfaces of column by the specially designed lower portion of the head. This feature eliminates undue wear, such as other grinders are subject to, and makes dust guards unnecessary.

Another feature of special note is the possibility of grinding concave and convex surfaces. This is accomplished through an angular swivel adjustment of the back column (held rigid for flat surface work) permitting a range of 4° from center.

The machines are made for wet grinding or dry; may be had belt driven or motor driven and can be used with plain chucks, face plates and other fixtures as well as the magnetic chucks.

The equipment for wet grinding is furnished complete and includes settling tank, service tank, piping and a pump of a size to assure a full supply of liquid at all times.

All these machines pass through our regular inspection for material, workmanship, finish and accuracy and will grind to within a manufacturing accuracy of .00025".



12" Rotary Surface Grinder with full Wet-Grinding Equipment

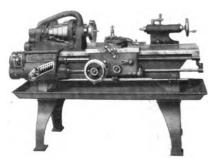
THE HENDEY MACHINE COMPANY

TORRINGTON, CONN., U. S. A.

CABLE ADDRESS: "HENDEY, TORRINGTON." Private and Lieber's Codes

NEW YORK OFFICE, Singer Building BOSTON OFFICE, Oliver Bldg. CHICAGO OFFICE, 618 Washington Boulevard ROCHESTER OFFICE, Chamber of Commerce Bldg.

Manufacturers of Lathes-Shapers-Millers



LATHES:

540

Swing	Beds in feet			
12"	4-5-6-7-8-9			
14"	5-6-7-8-10-12			
16"	5-6-7-8-10-12			
18"	6-7-8-10-12-14-16			
20"	6-7-8-10-12-14-16-18-20			
24"	8-10-12-14-16-18-20-24			

Cone or geared head.

Oil pans for all lengths of bed, excepting $20' \times 24''$, limited to 14'.

English or Metric pitches.

Precision lathes with complete tool room equipment or standard lathes for general manufacturing.



CENTERING MACHINE:

Capacity, 4" round bars, guaranteed to center within close limits of accuracy. Single spindle with watch tool chuck using combined drill and countersink. Vise and back support jaw work in unison.

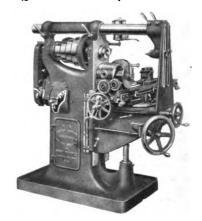


CRANK SHAPERS:

16"-20"-24" stroke.

Note:

Belt shifting device. Chip-proof table support. Quick-start and stop lever.



MILLING MACHINES: Plain and Universal

Feeds:

No.	P.	U.
1	22" × 8" × 19" 28" × 10" × 19"	18*
2	$22'' \times 8'' \times 19''$ $28'' \times 10'' \times 19''$	18"
3	$34'' \times 12'' \times 20''$	19"

KEARNEY & TRECKER CO.

MILWAUKEE, WIS., U. S. A.

CHICAGO OFFICE 631 Washington Blvd.

NEW YORK OFFICE 1801 Singer Building.

CLEVELAND OFFICE 738 Superior Ave., N. W.

Manufacturers of Milling Machines, Attachments and Accessories

MILWAUKEE MILLING MACHINES:

Double Overarm Constant Speed Drive **Automatic Flooded Lubrication**

The Double Overarm is clearly shown by the half-tone engravings. It consists of two steel bars arranged accurately parallel with the spindle at sufficient distance apart to form a rigid truss when the arbor supports are clamped to them.

The Work Table is made of semi-steel and is finished all over, as experience has shown that where scale is left on one side the table does not long retain its accuracy.



NO. 2B PLAIN

The Box Section Knee has no slot through the top to close under pressure of the saddle clamp or strain of the cut.

The Flanged Spindle provides means for efficiently holding cutters and driving them in either direction. The hardened steel arbor drive collar also provides an ideal drive for the arbors.

The Spindle Reverse is contained within the machine so that right- or left-hand cutters can be used without reversing the driving belt.

The Drive is through a single pulley running at a constant speed, giving 18 spindle speeds in geometrical progression of about 20 per cent.

The Lubricating System consists of a reservoir in the base of the machine holding several gallons of machine oil



NO. 2B UNIVERSAL

that is pumped to the top of the machine and distributed by a perforated pipe to all gears and bearings in the main frame and feed box, flooding downward on its 541 way back to the reservoir. All oil grooves are cut through so that the oil will wash away any foreign material and keep the bearings in condition.



NO. 214B VERTICAL

A Cutter Lubricant Pump is provided on every machine as all machines are usually used on steel or other material requiring lubricant. Adequate provision has been made for the return of the lubricant to the reservoir.

Catalogue, describing our complete production in detail, mailed on request,

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THE KEMPSMITH MFG. CO.

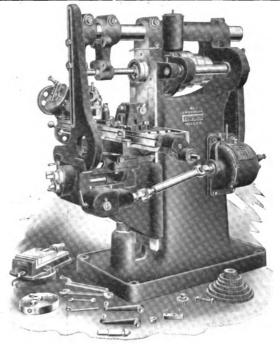
MILWAUKEE, U. S. A.

Manufacturers of Milling Machines and Equipment

KEMPSMITH MILL-ING MACHINES:

Both plain, universal, vertical and production types, are built in a wide range of sizes, adapting them for use on all classes of work, from the finest precision instruments up to the heaviest automobile and aeroplane engines, tractors and agricultural machinery.

These machines can be equipped at any time with a highly effective line of attachments.



Kempsmith Universal Miller with Full Equipment

		PLAIN			UNIVERSAL		
DIMENSIONS	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3	
Longitudinal table feed,	22"	28"-	34"	22"	28"	34"	
Transverse feed { Hand Power	8″	9"	11"	71/2"	8½"	10"	
Vertical feed { Hand Power	19"	19"	20"	18"	18"	19"	
Table, working surface Face of column to harness	423/8"x10"	45"x10"	54"x12"	39½"x8¼"	45"x10"	52"x12"	
brace, in position	17"	20"	22"	17"	20"	- 22"	
Spindle—taper hole (B & S)	No. 10	No. 10	No. 11	No. 10	No. 10	No. 11	
Cone, diam. largest step Cone, number of steps	101/2"	12½″	131/4"	101/2"	121/2"	131/4"	
Belt, width	23/4"	3"	31/2"	23/4"	3"	31/2"	
Spindle speeds, number	16	16	18	16	16	18	
Vise, size and type	No. 3-P1.	No. 3-P1.	No. 4-Pl.	No. 3-Sw.	No. 3-Sw.	No. 4-Sw.	
Arbor, diam. and length	1"x10½"	1"x10½"	11/4"x14"	1"x10½"	1"x10½"	1¼"x14"	
Floor space, direction of		22.					
spindle	56"	62"	66"	56"	62"	66"	
Floor space, direction of	90"	97"	114"	85"	97"	112"	
Net weight	2750 Lbs.	3150 Lbs.	4500 Lbs.	3100 Lbs.	3600 Lbs.	5000 Lbs.	
Domestic shipping wt	3250 Lbs.	3725 Lbs.	5040 Lbs.	3420 Lbs.	3915 Lbs.	5450 Lbs.	
Export shipping wt	3500 Lbs.	4040 Lbs.	5345 Lbs.	3650 Lbs.	4140 Lbs.	5932 Lbs.	
Dimensions of case for ex-		1010 1,00.	0010 200.	0000 2,05.	, 1110 1400.	BOOLES.	
port, large box	67x36x66"	67x37x70"	72x40x72"	66x36x67"	67x37x70"	72x40x72"	
small box			19x24x48"			19x24x48"	
Cu. ft. of export cases	92	101	133	92	101	133	
Telegraphic code word	KEDIV	KEDGE	KEEPER	KELK	KELPOT	KELSON	

SLOAN & CHACE MFG. CO., LTD.

OFFICE AND WORKS

SIXTH AVE., COR. N. 13TH ST., NEWARK, N. J.

Manufacturers of Precision Machinery, Dies and Special Tools

PRODUCTS: Bench Lathes, Bench, Milling Machines, Special Machinery, Jigs, Fixtures, Punches and Dies for Sheet Metal, Gauges, Countershafts, Etc. NO. 5½ BENCH LATHE:

With Compound Slide Rest



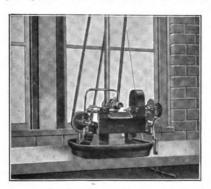
CAPACITY: 7" swing, 18" between centers (bed 35 inches long), 5%" through draw-in spindle, 3/4" with draw-in spindle removed.

AUTOMATIC PINION CUTTERS:

CAPACITY: No. 1, 1" diameter, 1" face; No. 2, 1" diameter. 1" face.

Automatic Pinion Cutters are built in two sizes, designated as Nos. 1 and 2. The No. 1 machine (illustrated) has a capacity up to 1" diameter and 1" face. The No. 2 machine is similar in construction to the No. 1, but larger, and having a capacity for gears and pinions up to 1" diameter and 1" face.

These machines are designed for the rapid production of cut pinions and small spur gears for watches, clocks, meters,



Automatic Gear and Pinion Cutter

etc., and the No. 1 Automatic Gear Cutter will cut brass gears up to 3½" diameter

SPEEDS: Cutter spindle, 1600; worm shaft, 1200; countershaft, 750; cutter feed, 0.07 per revolution.

BENCH MILLING MACHINES:



Bench Milling Machine

Bench Milling Machine is designed for use in the tool room, or for experimental work, though it is adapted to some classes of manufacturing. It is mounted upon the bench, or a cast iron pedestal 36" high.

COUNTERSHAFTS:

Suitable Countershafts are provided for all of our many different machines. Lathes are required to perform such a great variety of work and under such varying conditions that we have found it necessary to provide several kinds of countershafts for them. They are Wall or Ceiling Countershafts, both two and three speeds; Wall-Rod Countershafts, one and two speeds; Grinding Countershafts, used with either Wall, or Wall-Rod Countershaft.

We build Special Machinery to individual order, assisting in its development and perfection. Fine Model Making and Gauge Work.

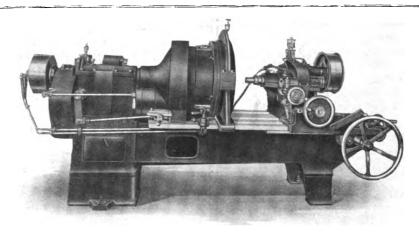
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543

SMALLEY-GENERAL COMPANY, INC.

BAY CITY, MICH.

Manufacturers and Builders of Machinery



SMALLEY GENERAL THREAD MILLERS are sturdy, powerful, accurate machines of the highest quality of material and workmanship designed to do the heaviest and most exacting work. Will mill threads with greater accuracy and speed and at lower cost than can be obtained by other methods. Will mill threads with one revolution of the work when multiple tooth hobs are used. The entire lubrication system is of liberal design and reliable. Clean cutting lubricant assured in ample quantities. Fully equipped with grease cups and self-closing oil cups. Belt or motor drive.

Various sizes and types of chucks may be used. Our Engineers will recommend methods of chucking.

NO I THREAD MILLER:

Capacity: Made in two sizes:

Size A—27 in. by 3 ft. 2 in. Size B—27 in. by 4 ft. 8 in.

Will mill external, internal, right hand, left hand, straight or taper threads up to 6 in. in length or 16 in. in diameter.

Designed for two speeds, milling or low and turning or high.

NO. 23 STANDARD THREAD MILLER:

A single purpose machine for production work, that has three turning speeds proportional to three milling speeds.

Capacity: 9 in. O. D. and 13 in. I. D., threads with 2-in. diameter hob. 21 changes of threads from 3½ per inch up on chucking type.

Equipped with hollow spindle for chucking long pieces.

SERVICE:

Send us blue prints of your threading problems. Actual samples sent at our expense would be still more satisfactory. With preliminary data in hand our Engineering Department would be pleased to give you an accurate time-study.

NO. I FLANGE THREAD MILLER:

For milling and facing standard flanges up to and including 16 inches diameter.

These machines are especially adapted for:

Milling and facing pipe flanges at one chucking.

Steep taper threads for oil-well tools Chasers and taps Automobile parts
Taper threads of all kinds
Straight threads of all kinds
Form circular milling
Continuous face milling
Cuts threads from 2 to 30 pitch

Smalley General Thread Millers will only be sold with the approval of our Engineering Department. A guaranteed production estimate will be furnished with each machine. In the event a machine should not perform and produce according to our guarantee, the purchaser will have the unquestioned right to cancel the sale.

THE WHITNEY MFG. CO.

HARTFORD, CONN.

Chains-Keys and Cutters-Hand Milling Machines



"Whitney" Keys

"WHITNEY" KEYS AND CUTTERS: For the Woodruff System

Used by the leading builders of automobiles and machine tools where strength, economy and absolute interchangeability are a necessity. Our customers state that sometimes it saves as much as 75% over the old method. The operation of cutting the key seat is simple and rapid, and requires no skilled labor.

THE "WHITNEY" HAND MILLER:



Is invaluable in the LARGE FAC-TORY as no other design equals it for big production on interchangeable work, as proved by the thousands of these machines in constant use both here and abroad. One concern alone is using over 800 of these machines and many other concerns have over one hundred each.

The "Whitney" Hand Miller is also invaluable in the SMALL SHOP as it will handle a wide variety of operations with convenience, accuracy and rapidity. Soon pays for itself.

"WHITNEY" TRANSMISSION CHAINS:

The Flexibility of Belts

The Positive Connection of Gears

545



Silent Type

For machine tools, line shafts, factory drives, electric motors. cam shafts, magnetos, lighting systems, generators, pumps, self-starters, etc.



Roller Type

Used by the leading makers of motor trucks and rendering satisfactory service every day in the year.

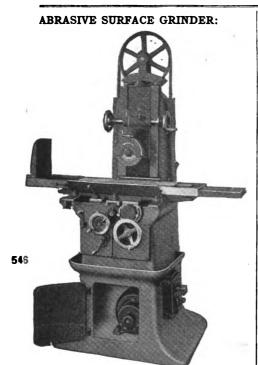
Our engineering department will be glad to assist you to secure maximum efficiency and service.

ABRASIVE MACHINE TOOL CO.

F. N. MACLEOD, Pres.

EAST PROVIDENCE, R. I.

Manufacturers of Precision Grinding Machinery and Index Centers



Reasons why you should select the "Abrasive." It is 50% heavier and correspondingly more rigid than other machines of its type, designed so as to practically eliminate vibration. The frame is a ONE-PIECE CASTING, three point support, which means neutralizing torsional strains, retaining alignment and minimizing other stresses.

Emery dust and water are kept from all operating parts by the careful precautionary measures evidenced in the design of the "Abrasive."

Protection to the operator is assured as there are no external moving parts except the emery wheel.

Convenience of control spells contentment to the operative; every wheel and lever is carefully placed in the most natural position.

Built by the unit system of construction. All screws cut to the U. S. Standard Thread system. The customer can make his own repairs. Extracts from Specifications to show performance, size and equipment.

Capacity:

22" Longitudinal Feed, automatic.

8" Transverse Feed, automatic.

12" Vertical Hand Adjustment.

Wheels up to 8" diameter by 34" thick.

Table:

Over-all dimensions, 934" x 56". Working surface, 71/2" x 22.

Three T-Slots, ⁹/₁₈" wide, are provided. Motor driven or belt driven. With Countershaft Drive; Steel hangers; ring oiling boxes; tight and loose pulleys 6" for 3" belt, and should run 450 R. P. M. Driving pulley to machine. 14½" for 2"

belt. Weight:

Net weight, countershaft-driven machine, about 1900 lbs.

Shipping Weight:

Domestic, about 2200 lbs.

Export, about 2330 lbs.

Export Dimensions, 42" x 50" x 72. Space occupied, about 88 cubic feet.

Floor Space:

Extreme dimensions, parallel with spindle, 47".

At right angles with spindle, 78".

Equipment: Adjustable Vise, jaws 4" wide, ¾" deep, opening 3"; one grinding wheel 8" x ½", 1½" hole; countershaft and wrenches.

Attachments:

Wet grinding; consisting of pump, piping, spray guards and nozzle.

Exhauster; consisting of exhauster, centrifugal dust separator, hood and guard.

Motor Drive; Motor mounted inside base. A. C. or D. C., 1800 R. P. M.

Complete Specifications and descriptive literature sent on request.

THE BLANCHARD MACHINE CO.

CAMBRIDGE, 39, MASS.

Blanchard High Power Vertical Surface Grinders

TRADE MARK



Reg. U. S. Pat. Off.

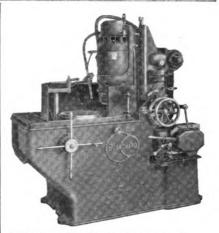
THE BLANCHARD GRINDER machines and finishes flat surfaces in one operation, directly from the rough castings or forgings, at a great saving over older methods

It is also the most rapid and economical tool for finishing small parts in quantities and is extensively used for such work as grinding the flat sides of ball bearing races, piston rings, chasers, small tools, thrust washers, etc.

Numerous repeat orders are constantly being received from firms who have used Blanchard Grinders on the most exacting production work for several years past. These are the best evidence of Blanchard economy and sustained accuracy.

Blanchard Grinders are built in two sizes, No. 10 and No. 16, and for either Direct Motor Drive (illustrated above), belted motor, or countershaft drive.

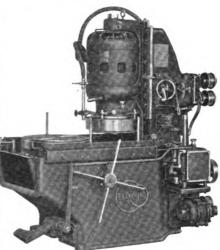
Descriptive matter on request. Send blueprints or samples of your work for production estimates.



NUMBER 10 BLANCHARD GRINDER:

Direct Motor Drive Type Range: 18" dia. x 6" high under new wheel Wheel: 10" dia. Chuck: 16" dia.

Motor, on spindle, 10 H. P. Weight of Machine, 6000 pounds



NUMBER 16 BLANCHARD GRINDER:

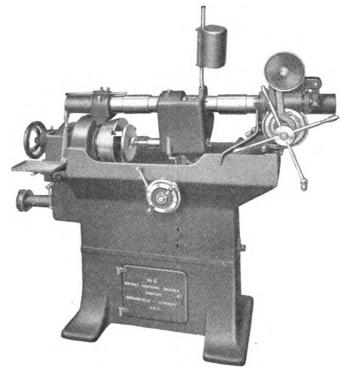
Direct Motor Drive Type Range: 30" dia. x 14" high under new wheel Wheel: 18" dia. Chuck: 26" or 30" dia. Motor on spindle, 25 H. P. Weight of Machine, 9500 pounds

548

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of Chucking or Internal Grinders



No. 6 Semi-Automatic Hole Grinder

SPECIFICATIONS OF BRYANT SEMI-AUTO-MATIC HOLE GRINDERS

	No.	No. 18	No. 20	No. 15	No. 15-A
Total Chuck Swing	1256"	2734"	131/2"	125%"	125%
Maximum Wheel Slide Traverse	8"	1114"	1414"	1114"	1147

Grinder Number 15 is furnished with two-spindle wheel slide for hole and face grinding, and when furnished in this way we call it Number 15-A. This makes it possible to make the two operations at a single holding of the work and insures accuracy for finished surfaces.

Bryant Chucking Grinders make unnecessary the use of arbors or center point supports. It has wheels for inside and outside—straight or taper grinding; wheels for face grinding and wheels for polishing. Internal holes ground with diameters of one half inch up.



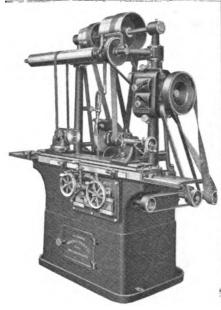
Bryant Chucking grinders mean real precision interchangeable manufacturing.

Send for complete catalog.

WARREN F. FRASER CO.

FACTORY AND GENERAL OFFICE: WESTBORO, MASS.

Manufacturers of Grinding Machinery



NO. I UNIVERSAL CONVERTIBLE GRINDER:

This machine is designed and built to meet the exacting requirements of fine grinding in connection with tools, gauges, jigs and fixtures and production work within its range.

By the simple method of changing the heads we are able to do cylindrical, surface and internal work on the one machine

Capacity of the machine is as follows:

Cylindrical 8" x 20" long

Surface 6" x 20" long up to 8"

Internal work of wide range is possible and a max. spindle speed of 25,000 R. P. M. is provided.

HIGH-POWERED SELF-CONTAINED UNIVERSAL GRINDER:

These machines are made in four sizes, namely:

No. 2 10" x 30" No. 2-A 12" x 30" 10" x 42" No. 3 No. 3-A 12" x 42"

HIGH-POWERED UNIVERSAL GRINDER, COUNTER-SHAFT DRIVE:

We also build these machines in four

No. 2-C 10" x 30" No. 3-C 10" x 42" No. 2-AC 12" x 30" No. 3-AC 12" x 42"

Both of the High-Powered Grinders can be equipped with an internal grinding head which has a max. spindle of 25,000 R. P. M.

NO. 21 PLAIN GRINDER:

This machine has a rated capacity of 5'' diameter x 8'' long, and carries wheels 12'' in diameter x 3'' hole and up to $1\frac{1}{2}''$ face. The headstock is of a dead center type; live center headstock can be furnished as an extra, and is provided with an operating lever so arranged as to start and stop the work rotation instantaneously.

There are two wheel speeds of 1800 **549** and 2150 R. P. M. and five work speeds of 35, 60, 90, 130, 180 and 260 R. P. M. are provided for with table speeds of $\frac{5}{32}$ ", $\frac{1}{2}$ " and $\frac{5}{8}$ " per revolution of work.

NO. 31 SEMI-AUTOMATIC GRINDER:

Of special design so as to give quality and quantity of production. This machine is rigidly constructed and is guaranteed to duplicate parts to within very close limits. All spindles are hardened steel and bearings are adjustable for wear.

Wheels $12'' \times 3''$ hole and up to $1\frac{1}{2}''$ face can be used.

NO. 32 SEMI-AUTOMATIC GRINDER:

An advance over the general ideas of grinding machinery has been made in the construction of this machine making it superior to others of this type. This machine carries a wheel 12" diameter x 5" hole up to 2½" face. All spindles are hardened and bearings adjustable for wear.

Our Semi-Automatics are production machines which really produce accurate duplicate parts, together with a high standard of finish and at a very rapid rate.

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THE HEALD MACHINE COMPANY

WORCESTER, MASS.

Branches at New York Philadelphia Cleveland Detroit Cincinnati Chicago

Manufacturers of Grinding Machines and Magnetic Chucks



PRODUCTS:

550

Internal, Surface and Cylinder Grinding Machines.

Magnetic Chucks.

SURFACE GRINDING MACHINES:

Heald Rotary Surface Grinders are simple, accurate and highly productive

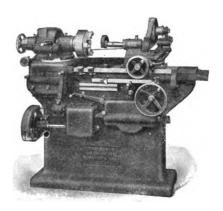


Style No. 22 Surtace Grinder

machines for grinding either hardened or soft work such as dies, discs, collars, washers, saws, gauges, cutters, piston rings, or any other flat work. Owing to the fact that we build our own magnetic chucks, we are in a position to offer supplementary top plates which can be cut out to hold certain classes of irregular shaped work. These machines have both automatic and hand feed for wheel slide. They will grind concave or convex and can be used wet or dry. Furnished in two styles: No. 20 which has an 8" magnetic chuck, and No. 22 which has a 12" magnetic chuck.

INTERNAL GRINDING MACHINES:

Heald Internal Grinders are built to handle work which is easily revolved such as bearings, cutters, ball races, hardened gears, cylinders, gauges, cones, etc. They are primarily production machines, simple in design, built to maintain a fine degree of accuracy. The workhead is graduated to 45° each side of the center. Every machine is equipped for wet or



Style No. 70 Internal Grinder

dry grinding. A radius truing device (extra) will either concave or convex the wheels for grinding curved surfaces.

Machine Style No. 70: Capacity 15" swing x 11" long. Has both automatic and hand feed to table. 12 sizes of instantly interchangeable wheel heads to select from.

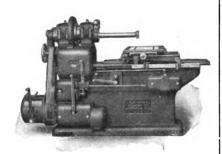
Machine Style No. 75: Capacity 15" swing x 8" long. Construction is similar to No. 70, except has hand feed only for table.

Machine Style No. 85: Capacity 10' swing x 2½' long. Works best on holes smaller than ¾' diameter.

THE HEALD MACHINE COMPANY

CYLINDER GRINDING MACHINES:

These machines are especially designed for internal grinding of holes in work of such shape that it is inconvenient or impossible to rotate it when machined in the usual manner. They are especially valuable for grinding airplane, marine or automobile engine cylinders. Moreover they make valuable equipment in railroad shops for grinding bearings in valve motion parts, side rods, bushings and air brake parts such as triple valves, etc. The work is easily handled due to such features as a large crosswise adjustment of the work, multiple feeds for rotation of the work, multiple feeds for travel of the table, quick-change gear boxes for feeds and speeds, micrometer readings throughout, centralized control of levers, and massive construction.



Style No. 65 Cylinder Grinder

Machine Style No. 65: Vertical adjustment is secured by means of an inclined slide located between the main table and cross slide table. Longitudinal movement of this intermediate slide raises and lowers the work.

Machine Style No. 60: Similar to No. 65 but having a vertical adjustment of 31/2" obtained by movement of a knee casting clamped to the bed. This machine is particularly suitable for garage work or any shops where there is a variety of different size work requiring large vertical movement.

MAGNETIC CHUCKS:

Any iron or steel work that has a flat and fairly smooth surface can be held by a magnetic chuck for machining on milling, planing, grinding or shaping machines.



Heald Rotary Chuck

Heald chucks have a holding power of 100 to 220 lb. per sq. in., depending upon the size of the chuck. They demagnetize 551 completely; can be used wet or dry; hold uniformly over the entire surface; and are easily converted from 110 to 220 volts.



Heald Rectangular Chuck

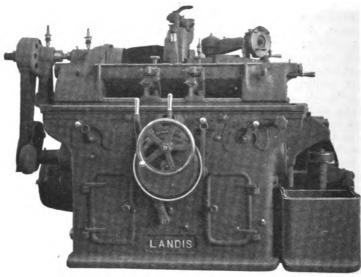
Magnetic chucks greatly reduce the time required to set up work; lower the cost for special fixtures; increase the production of machines and the output of operators; handling work which could not be machined with mechanical fixtures. Built in rotary styles from 6" to 24" dia.: rectangular from 4" x 10" to 14" x 36". Styles up to and including 6" x 18" can be furnished with taper, swivel or combination bases.

LANDIS TOOL COMPANY

WAYNESBORO, PA.

NEW YORK OFFICE: 50 Church St.

Manufacturers of Precision Cylindrical Grinding Machines



Improved Self-Contained Grinding Machine

552

Our regular line consists of the following types:

UNIVERSAL MACHINES: No. 1, No. 1½, No. 2, No. 3, No. 4 are used for finishing tools and a variety of straight or taper parts, both external and internal such as are common to the tool room, machine shop, railroad shops, etc.

Attachments, such as magnetic chuck, gear-cutter attachment, side mill grinding attachment, etc., can be used on these machines to advantage.

PLAIN GRINDING MACHINES: Sizes 6", 10", 12", 20", 30", 40" swings in standard lengths. These strictly manufacturing machines are intended for finishing straight and taper spindles, shafts, rolls, tubing and all other work which can be revolved on dead centers.

PLAIN GRINDING MACHINES WITH GAP are our 20" swing Plain Machines, built with gap in the bed to suit the location of the projection on the work. Especially suitable for grinding locomotive piston rods.

INTERNAL GRINDING MACHINES for straight and taper internal grinding.

The internal fixtures for these machines will grind holes $\frac{1}{4}$ in diameter, or larger, and up to 12" long.

CRANK GRINDING MACHINES for grinding single or multiple throw crank shafts used in gas and small steam engines.

ROLL GRINDING MACHINES for grinding chilled iron and hardened steel rolls.

CAM GRINDING ATTACHMENTS (for use on our plain and universal grinders) for grinding either detachable or integral cams.

BALL BEARING RACE GRINDING MACHINES for grinding the raceways in radial, thrust and cone ball bearings.

LANDIS

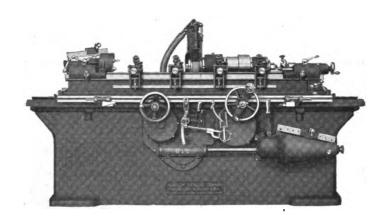
Our illustrated and descriptive catalogues and literature give detailed information. They also describe the features which stand for quick manipulation, accurately finished work, durability of alignments and rapid production—all of which are prominent in the various types of Landis Grinding Machines.

NORTON COMPANY

WORCESTER, MASS., U. S. A.

Cable Address: "NORCO"
A. B. C., Lieber's, Business, New Business and Western Union Codes

Manufacturers of Grinding Machinery



CYLINDRICAL GRINDING MACHINES: |

Swing-3"-6"-10"-14"-16"-18"-20"-22"-24"-26", and of Various Lengths between centers.

SURFACE GRINDING MACHINES:

WIDTH OF TABLE—15", distance between wheel and table, 17".

Length of Table—6'—8'—10'—12'—14'.

CRANKSHAFT GRINDING MACHINE:

UNIVERSAL TOOL AND CUTTER GRINDING MACHINES:

SIZE No. 1. SWINGS 8" or 10", TAKES 15" between centers.

Size No. 2. Swings 10" or 12", Takes 32" between centers.

ROLL GRINDING MACHINES:

553

BUILT TO ORDER.

CAR WHEEL GRINDING MACHINES:

For grinding mounted car wheels while revolving on their own journals.

RUNNING BALANCE INDICATING MACHINES:

This machine is made for locating errors in running balance of revolving parts. Particularly adapted for testing automobile crankshafts, fly-wheels and clutches and armatures for small motors.

Send for Illustrated Literature.

MODERN TOOL COMPANY

ERIE, PA.

Manufacturers of "Modern" Cylindrical Grinding Machines

SALES AGENTS IN AMERICA:

Walter H. Foster Co., New York
Marshall & Huschart Machinery Co., CHICAGO
Manning, Maxwell & Moore., Inc., St. Louis
F. E. Satterlee Co., Minneapolis
Herberts Machinery & Supply Co., Los Angeles and San Francisco
Rudel-Belnap Machinery Co., Ltd., Toronto and Montreal

BRANCH OFFICES:

DETROIT, MICH.

BUFFALO, N. Y. Representatives in Principal Foreign Countries CLEVELAND, O.

PLAIN SELF-CONTAINED GRINDING MACHINES:

8 sizes, 8" x 18", 8" x 30", 12" x 36", 12" x 48", 12" x 60", 16" x 36", 16" x 48", 16" x 60".

Main drive is single pulley or motor drive. All controls centered on front of machine. Main drive runs at constant speed. All speeds and feeds from one gear box. Work drive is positive through silent chain. Headstock fully mounted on ball bearings. All models fully guarded. Send for complete technical bulletin.



Capacity:

13" swing, 40" between Centers.

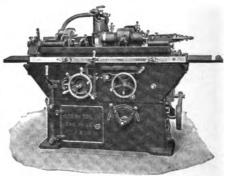
External and Internal in combination, embodying insofar as possible all the distinctive features of Modern plain and internal grinders. A superior machine for tool room or shop with many advantages for manufacturing. Send for complete technical bulletin.

INTERNAL GRINDING MACHINE:

Capacity, length—7".

Diameter of swing—10".

Rigidity is one of its dominant features. Has the strength for heavy duty. Numerous advantages over other types. Send for complete technical bulletin.



Plain, Self-Contained Grinding Machine





Internal Grinding Machine

MODERN TOOL COMPANY

ERIE, PA.

Manufacturers of Self-Opening and Solid Die Heads, Hollow Milling Tools,
Magic Chucks and Tapping Attachments

BRANCH OFFICES

DETROIT

New York

Сніслоо

PHILADELPHIA

CLEVELAND

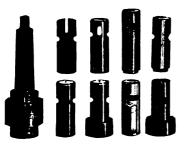
BUFFALO

MODERN SELF-OPENING, ADJUST-ABLE DIE HEADS:



17 sizes, range $\frac{1}{16}$ to 7". For any threading. Used on hand or automatic screw machines, lathes and other revolving spindle machines. Each head will cut a wide range of diameters, any form or pitch, right or left hand. Will thread any length travel of turret will permit, full length or close to shoulder. May be cleaned without taking entirely dismounting. Chasers apart or hobbed. Interchangeable sets. Fitted with micrometric adjustment for tight or loose threads. Send for complete technical bulletin.

MODERN MAGIC CHUCK AND COLLET EQUIPMENT:



"Magic" Chuck and Collets

For changing small tools quick—practically instantly. Used on drill presses,

lathes and other revolving spindle machines. Practically converts single spindle machines into multiples with as many holes as you have tools to use. Takes drills, reamers, boring bars, end mills, taps, etc. Send for complete

technical bulletin.

MODERN SOLID DIE HEADS AND HOLLOW MILLING TOOLS:

Basic principle same as our Self-Opening Die Head. Exceptionally strong and accurate. Built in



7 sizes. Threading range 1/8" to 4". Send for complete technical bulletin.

MODERN CHASER GRINDER:

For any style or make chasers having parallel sides. It is a splendid and efficient grinder for general tool room work. Belt or motor drive. Send for complete bulletin.

MODERN TAPPING ATTACHMENTS:

Drives small tools through holes or to bottom, stops and backs out automatically without stopping or reversing machine. No reversing of belt required. Very valuable for successive operations without removing work.

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NOBLE & WESTBROOK MFG. CO.

HARTFORD, CONN., U. S. A.

Manufacturers of Dwight Slate Marking Machines, Marking Devices of Every Description, Expert Die Cutting and Engraving, Filing Machines, Grinding and Polishing Machines

DINGIT SLUTE MARION MARINE

These Machines Will Mark Artistically Any Article or Any Material Suitable for Impressions.



Hand or Power Machines Recommended

A specialty of our line of manufacture is the making of devices and machines for placing on flat or round metal surfaces, impressions of trade-marks, patent dates, graduated scales and a variety of similar work. These machines are not expensive, are adapted to the work, do it in a superior manner at less cost then is possible on any makeshift devices.

A neat mark is desirable, adds to appearance of goods, and is a feature that the manufacturer cannot afford to ignore. Goods of all kinds are put on the market in more tasty and improved form than a few years since. Both trade and purchasers call for these qualities. Antiquated and clumsy designs that were "good enough" are rapidly being displaced by improved forms and finish. By using modern machinery this is done at saving of original cost; therefore, when

we offer better work at less cost we ask its consideration. Samples or sketches of work are solicited, proper machines recommended, and complete outfits furnished.

DIE CUTTING BY EXPERT ENGRAVERS:

For these Machines a Specialty

We have a large force of expert engravers familiar with the die cutting for these machines, and in order to get the best results we would recommend that you send us samples and let us furnish you the first equipment of dies and fixtures.

GRINDING AND POLISHING MA-CHINES:

A Full Line

The new Noble & Westbrook Automatic Surface Grinder, furnished with or without magnetic chuck, is dust-proof, has feed dials graduated to .001", and has a capacity of 8" x 20". All slides and spindles are adjustable for wear.



Automatic Surface Grinder

Catalog gives complete details.

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WILMARTH & MORMAN CO.

GRAND RAPIDS, MICH.

Manufacturers of Grinding Machinery

NEW YANKEE DRILL GRINDERS:



Do you have trouble with drills cutting oversize? Do your drills split? Do your drills overheat and lose their temper? If they do they are probably ground incorrectly. A Wilmarth & Morman New Yankee will automatically grind them correctly, giving them just the right angles, clearances and equal cutting lips.

14,000 users endorse this drill grinder for the added life it has given their drills, the faster drilling possible for its use and the improved product. Made for either wet or dry grinding to take drills from No. 52 to 3½°.

Made also in combination with a Wilmarth & Morman tool grinder.

Send for catalogue.

SURFACE GRINDERS:



Have you ever had an expensive die ruined in grinding? Wilmarth & Morman Wet Surface grinders are built to prevent this and still take a cut of .050 to .070 of an inch. They are also made as dry surface grinders adaptable for gauge and tool work.

They are of heavy design and substantially built to eliminate vibration and the chatter resulting therefrom.

Each machine has a diamond wheeltruing device permanently attached ready for instant use.

Send for catalogue.

UNIVERSAL GRINDERS:



The Wilmarth & Morman grinder means grinder service unexcelled. They are of reasonably large capacity, absolutely universal range and are built to do accurate work continuously.

Some of the forms of grinding they can do are:

Internal.
Side, angle or face milling cutters.
Straight or taper reamers.
Face grinding.
Formed cutters.
Hobs.
Gears.
Saws.
Cylindrical.

Send for catalogue, south

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CHALLENGE MACHINE CO., INC.

PHILADELPHIA, PA.

Manufacturers of Challenge Grinding-Wheel Machines and Truedge, Gruva, Gardi and Huntington Dressers, etc.

CHALLENGE GRINDERS:

List Prices expressed in UNITS

Prices F. O. B .- Figure the net of each Unit wanted, add them together and it will be the total net of that combination, that size. Sizes (see Unit 1) indicate that wheels should not be larger; but may, of course, be smaller.

NOTE—On the following page are shown 8 of the 16 combinations that can be set up by merely bolting together the following Units or Attachments:

UNIT I is the head or bench machine, the master UNIT. It has ring oiling babbitted

558



oiling babbitted bearings and the spindle is arranged with the Challenge CAM SET-COLLAR, pre-with the Challenge CAM SET-COLLAR, pre-with Challenge DRAWwith the Challenge CAM SEL-COLLAR, preventing end play. Also with Challenge DRAW-OUT quickly adjusted workrests. When stripped of the workrest it is arranged for polishing. When ordered with special length or regular stock-length polishing spindle add \$ list. Tight and loose or cone pulley add \$ list. Size Wheels: 12 in., 12 x 2 x 1; 14 in., 14 x 2 x 1½; 16 in., 16 x 2½ x 1½; 18 in., 18 x 3 x 1¾ in. hole. Bolts onto all other Units. Ball Bearings special.

12 in. 14 in. : \$20 \$25 16 in. List Prices: \$20 \$50

UNIT 158 is the WHEEL GUARD. It is forged channel steel; therefore very strong. It is adjustable vertically and horizontally to follow the wear of wheel. Has eye guard attached. No wheel should be used without it. Bolts onto Unit 1, single or double. Size Wheels same as Unit 1



12 in. List Prices: \$15 \$18 \$21 \$24

UNIT 3 is the TOP SUR-FACE UNIT. The work is passed over a slot in the table. Table has fine screw adjustment. Size tables: 12 in. machine, 6 x 12 in; 14-in. machine, 9 x 19 in; 16-in. machine, 11 x 21 in.; 18-in. machine, 11 x 21 in.; Bolts onto Unit 1, single or double. Size Wheels same as Unit 1. Unit 1.



Sizes: 12 in. List Prices: \$25 18 in. 14 in. 16 in \$35 \$45 \$50

UNIT 157 is the DUPLEX URFACE UNIT. It may SURFACE be used either as illustrated or be used either as illustrated or inverted for grinding on top of the wheel as in UNIT 3. It has micrometer adjustment. Distance from wheel is ample for any job. Will grind to the centre of dies or pieces 6, 8, 12 and 16 inches wide according to size machine. Bolts onto Unit 1, single or double. Size Wheels: May be same as Unit 1 but usually are smaller



12 in. 14 in. 16 in. 18 in. Sizes \$100 List Prices: \$50

UNIT 156 is the WET TOOL UNIT. Operated by foot the water recedes from the wheel water recedes from the wheel automatically. It can't get out of order as does every power method of applying method of applying water. Being OUTSIDE is ACCES-SIBLE and easily cleaned and does not slop. Foot piece for bench machine is attached to floor. Bolts onto Unit 1, single or double. Sing Wheels. floor. Bolts onto Unit 1, single or double. Size Wheels same as Unit 1.



Sizes: 12 in. List Prices: \$50 14 in. 18 in. \$100

UNIT 4 is the CUPPED WHEEL or DISK UNIT.
Table tilts and is adjustable in all directions. Size Tables: Table tilts and is adjustable in all directions. Size Tables: 12-in. machine, 4 x 16 in.; 14-in., 4 x 16 in.; 16-in., 5 x 20 ins.; 18-in., 5 x 24 ins. Bolts onto Unit 1, single or double. Size Wheels: The cup wheel should be smaller than solid wheels on Unit 1. than solid wheels on Unit 1.



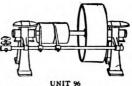
16 in. 18 in. List Prices: \$25 \$35 \$45 \$50





in. \$180.00 in. 205.00 in. 285.00 in. 300.00 14 in. 16 in. 18 in.

UNIT 6 is the PLAIN COLUMN. UNIT 7 is the column having COUNTER SHAFT attached and UNIT 133 is the COLUMN HAV-ING MOTOR attached. UNIT 96 is the overhead COUNTER-SHAFT.



16 in, \$20.00 List 18 in, 22.00 List

NOTE-The above list prices are for EACH Unit. All wheels extra. For price of wheels use any standard list, and deduct the then current rate of discount.

CHALLENGE MACHINE CO., INC.

CHALLENGE GRIND-ERS:

For List Prices and Description of each FEATURE of each machine illustrated on this page, see preceding page. Begin with Unit 1.



Polishing Machine



Dry Grinder



Dry Grinder with Guards



Double Wet Tool Grinder



Surface and Wet Tool Grinder

559



Wet Tool and Dry Grinder with Guard

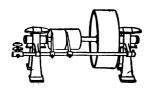


Disc and Wet Tool Grinder



Wet Tool and Dry Grinder with Guard and Duplex Surface Attachment

Note—Rear Views of the columns of above grinders are shown in the cuts of the columns below Thus any form of Drive may be had. See preceeding page, Units 6, 7 and 133.









THE BLAKE & JOHNSON COMPANY

Established 1849
MACHINERY DIVISION
WATERBURY, CONN.

SPECIALISTS

IN

MACHINERY

FOR

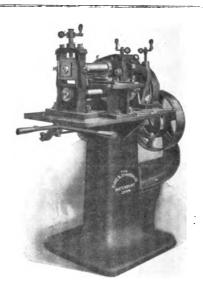
MANUFACTURING

METALS

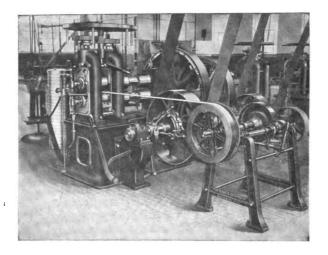
IN

560 THIN GAUGES

COLD ROLLING MACHINERY
For Steel, Brass, Copper, Etc.



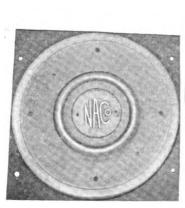
BUILDERS OF SLITTERS

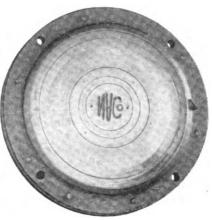


DOVE-SMITH & SON

NIAGARA FALLS, N. Y.

Designers and Builders of Special Machinery Tools and Gauges





561

We are prepared to design and build special machinery for any purpose, weight not to exceed 5 tons.

Special Machine Tools

Jigs and Fixtures

Punches and Dies

Drum Shop Equipment

Special Thread Cutting

Paper Box Machinery

Dies for Rubber Works

Regrinding Rolls up to 20" diam. x 10" long

Carbonizing

Heat Treating

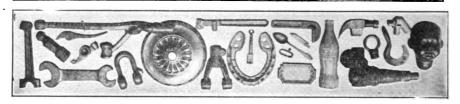
Experimental Work

Inventors' Ideas Developed

We make a specialty of working to either metric or decimal dimensions

KELLER MECHANICAL ENGRAVING CO.

68 Washington St., Brooklyn, NEW YORK CITY



AUTOMATIC DIE SINKING MOLD CUTTING MACHINES of many types to meet a variety of conditions and requirements.

With the constantly increasing demand for DIES and MOLDS the supply of skilled labor has become entirely inadequate.

Keller Machines have solved this problem for industries requiring forging and stamping dies, molds for bottles, for pressing compositions, for die casting, etc.

THE 1920 MODEL KELLER 562

machine presents many improvements combining the experience of the many users of the machines with our own. It is much heavier throughout than previous models, eliminating vibration and "chatter" and permitting the use of coarser feeds and higher speeds, with heavier mills. All adjustments, set ups, etc., have been rendered extremely easy and rapid and so simple from the standpoint of attendance as to make this method of die sinking automatic in the fullest sense.

The Keller Method is successfully employed in many of the country's leading plants producing

Automobiles

Marine Hardware

Small Arms (Rifle, Machine Guns, etc.)

Scissors. Shears, Manicure Goods and Surgical Instruments

Cutlery

Wrenches

Small Tools

Sporting Goods

Saddlery and Harness Hardware

Silver and Plateware (Flat and Hollow)

Glass Bottles

Rubber (Hard and Soft)

Rubber Substitutes, Compositions and Plastic Materials (Celluloid, Bakelite, etc.)

Ball Bearings Horse Shoes

Brass Goods Die Castings

Glass Ware

Builders' Hardware

Trunk Hardware

Medals and Badges

Tewelry

Typewriters

Sewing Machines

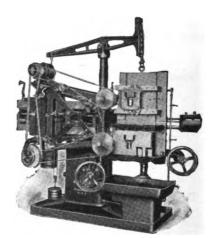
Stamps, Letters and Figures Steel Brands

Wagon and Carriage Hardware

Valves

Chocolate Moulds

Also in Railroad Shops and Car Works Arsenals and Navy Yards



Model "E-4" Keller Automatic Die Sinking Machine Cutting a Forging Die

VIBRATION SPECIALTY COMPANY

PHILADELPHIA, PA.

OFFICES: 303 Harrison Building LABORATORY: 1534 Winter Street BELL 'PHONE: Spruce 2489

N. W. AKÍMOFF, Engineer and Manager

(Positively not connected with any other concern)

Manufacturers of Special Machinery for the Study and Elimination of Vibrations, Including Balancing Machinery (Static and Dynamic) of Latest Types

OUR ACTIVITIES ARE FOUR-FOLD:

- 1. The manufacture of balancing apparatus (latest Akímoff designs), and all sorts of special machinery for the study and elimination of vibrations in buildings, machinery, ships and structures of all kinds.
- Practical balancing, both in our laboratory and in the field; all weights and sizes.
- The designing of high-speed parts, such as crankshafts of gas engines; special rotors of all kinds.

4. Research work along all lines of mechanical engineering, with facilities for working out difficult problems of engineering practice.

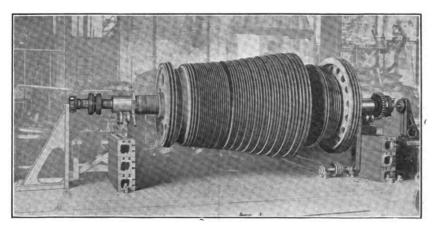


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Mr. Akimoff's initials

M

are our Trade Mark



The weight of this steam-turbine rotor is 35,000 pounds, overall length 22 feet, diameter 7 feet.

It was put in perfect running balance on our portable equipment

LANDIS MACHINE CO., INC.

WAYNESBORO, PA., U. S. A.

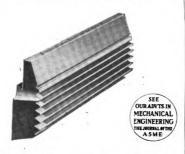
Manufacturers of Bolt Threading, Nut Tapping, Pipe and Nipple Threading and Pipe Threading and Cutting Machines; Automatic Die Heads and Chaser Grinder

THE LANDIS CHASER:

The design of the Landis chaser is entirely different from any other type of die and it embodies features which insure a high production of clean-cut, well-formed threads at a minimum cost of die maintenance.

Distinctive Features of the Landis Chaser

Its length is such as to give a life many times that of any other die. It has a variable rake angle which permits of a grinding suitable for the material being threaded. It has a line contact with the stock, thereby reducing the friction to a minimum and permitting of exceptionally high cutting speeds. The throat or bevel is permanent, insuring close shoulder work at all times. The chasers are interchangeable to the extent that any one or more of a set can be replaced without renewing the entire die. The chaser is milled and hardened its entire length, eliminating the necessity of annealing, hobbing and re-



tempering. The chaser is sharpened by merely grinding it at the end. High speed steel can be used to better advantage than in any other type of die.

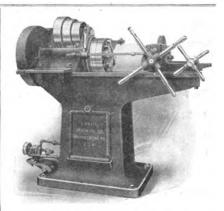
THE LANDIS DIE HEAD:

564

The die head is made entirely of steel. It has a diametrical adjusting mechanism which permits of a universal adjustment. The head is provided with an automatic opening and closing device which derives its action from the forward and backward travels of the carriage. This device is located within the head and carries all the cutting strain. It also serves to lock the head, relieving the yoke of this duty. The head is graduated both right and left hand for all sizes within its range.

THE LANDIS BOLT THREADING MACHINE:

The Landis Bolt Threading Machine is designed to give economical service and accurate results. The frame is cast in one piece. An excellent die lubricating system insures a sufficient flow of lubricant at all times. The carriage is gibbed to the bed to compensate for any wear. The vises have a horizontal sidewise, as well as a vertical centering adjustment, permitting a perfect and permanent alignment with the die. All gears are enclosed to provide for the safety of the operator.



THE LANDIS PIPE AND NIPPLE THREAD-ING MACHINE:

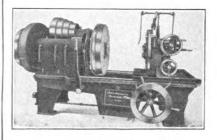
ING MACHINE:

The Landis Pipe and Nipple Threading Machine is similar in design to the Bolt Threading Machine. It is equipped with a reaming device which removes the burr which forms during the cutting-off operation, while the pipe is being threaded. Nipple grips are provided with both plain and threaded surfaces to receive the blank and threaded pipe ends.

THE LANDIS PIPE THREADING AND CUT-TING MACHINE:

The Landis Pipe Threading and Cutting Machine employs a stationary type die head. The entire range of each head with the exception of the 2" size is covered by but one set of chasers. The head is manually operated and under working conditions is locked within itself.

The machine is rigid in construction and its design embodies all features to facilitate production and to insure safety for the operator. The carriage supports the head, cutting-off tools, reaming device, and length gauge, all located conveniently for efficient service.



Catalogue No. 24—Bolt Threading Machinery. Catalogue No. 25—Pipe Threading Machinery.

LANDIS MACHINE CO., INC.

SPECIFICATIONS OF STANDARD BOLT THREADING MACHINES

T	Size	Range	Chaser Equipment	R. P. Counte	. M. ershaft		Floor Space	Approx.
Type Size		Range	Inches	Carbon Steel	H. S. Steel	Required		Weight Lbs.
	1/2"	1/4" to 1/2"	1 set each of 1/4, 16, 3/8, 1/8 and 1/2.	180	300	1'	9"x4' 1"	850
ö	1"	1/4" to 1"	1 set each of 14, 58, 12, 58, 34, 78 & 1.	200	300	2'	3"x4'1112"	1350
hin	11/4"	3/8" to 11/4"	1 set each of 3/8, 1/2, 5/8, 3/4, 1/8, 1, 11/8 and 11/4.	300	450	2'	3"x4'11!2"	1400
Machines	11/2"	15" to 112"	1 set each of ½, 5%, ¾, ½, 1, 1½, 1¼, 1¾, 1¾, and 1½.	280	400	2'	3"x4'11½"	1400
Head	2"	12" to 2"	1 set each of ½, 5%, ¾, ¼, 1, 1 ½, 1¼, 1¾, 1½, 1¾, 1¾, 1¾, 1, 1¾, 1¾, 1, 1¾, 1¾, 1, 1¾, 1¾	225	400	2'	8"x7' 1½"	2200
	212"	34" to 212"	1 set of $\frac{3}{4}$, $\frac{7}{8}$, 1, 1 $\frac{1}{8}$, 1 $\frac{1}{4}$, 1 $\frac{3}{8}$, 1 $\frac{1}{2}$, 1 $\frac{5}{8}$, 1 $\frac{3}{4}$, 1 $\frac{7}{8}$, 2, 2 $\frac{1}{4}$ and 2 $\frac{1}{2}$.	300	500	2'	8"x7' 1½"	2300
Single	3″	1" to 3"	1 set each of 1, 1 1/8, 11/4, 13/8, 11/2, 15/8, 13/4, 17/8, 2, 21/4, 21/2, 23/4 and 3.	300	500	3′	7"x9' 1"	4200
Š	4"	1½" to 4"	1 set each of 1½, 15%, 1¾, 1½, 2½, 2¼, 2½, 2¾, 3, 3¼, 3, 3¼, 3½, 3¾ and 4.	300	500	3′	7"x9' 1"	4550

	12"	¼″ to ½″	2 sets each of $\frac{1}{4}$, $\frac{1}{16}$, $\frac{3}{8}$, $\frac{1}{16}$ and $\frac{1}{2}$.	180	300	2'10 ¹ / ₂ "x4' 1"	1400
œ	1"	14" to 12"	2 sets each of $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{3}{4}$ and	200	300	3' 6"x4'11½"	2250
achines	1		1 set each of $\frac{7}{8}$ and 1.			1	
Ħ	11/4"	3/8" to 11/4"	2 sets each of $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ and $\frac{7}{8}$ and	300	425	3' 6"x4'1119"	2350
2	1 1	,,,,,,	1 set each of 1, 1 1/8 and 11/4.			1	
Ž	11/2"	12" to 11/2"	2 sets each of $\frac{1}{2}$, $\frac{5}{8}$, $\frac{8}{4}$, $\frac{7}{8}$ and 1 and	280	400	3' 6"x4'111/2"	2400
			1 set each of 1 1/8, 11/4, 13/8 and 11/2.		1	1 1	
ם	2"	1/2" to 2"	2 sets each of 1/2, 5/8, 3/4, 7/8, 1, 1 1/8, 11/4,	225	400	4' 12"x6' 412"	3800
ē	l -	/•	13/2 and 11/2 and 1 set each of 13/1 & 2.		1	1	
Ĭ	212"	34" to 214"	2 sets each of 34, 78, 1, 1 18, 114, 138,	300	500	4' 15"x7' 115"	4050
•	} -/-	/ • ·····	11/2, 15/8, 13/4, 11/4 and 2 and 1 set			1 /	
u ble		ļ	each o. 214 and 212.		Į.	1 1	
8	4"	11/2" to 4"	2 sets each of 11/2, 15/8, 13/4, 17/8, 2, 21/4,	300	500	8' 6"x7' 0"	8200
Ď	1 .	-/ • • • •	2^{1}_{2} , 2^{3}_{4} and 3 and 1 set each of 3^{1}_{4} ,	- 30		1 1	
	1		312, 334 and 4".		1	1	
			,,		<u> </u>		

565

9 1"	14" to 1"	1 set each of ½, ½, ½, ½, ⅓, ¼, ⅓ and 1. 1 set each of ½, ⅙, ¾, ⅙, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	400 250	550 360	5' 4½"x4'11½" 5' 4½"x4'11½"	3350 3650
Triple Head Machine 5,	12" to 2"	13% and 1½. 1 set each of ½, 5%, 34, 78, 1, 1½, 1¼, 13%, 1½, 13, and 2.		700	6' 1½"x6' 1"	5400

LONG BED THREADING MACHINES WITH LEADSCREW ATTACHMENTS

Sin. 112"	12" to 112"	As desired	225	360	2'	3"x7' 3"	1450
Head 212"	34" to 212"	As desired	300	500	8'	31 ₂ "x2'11"	3000
Dou. 11/2"	½ to 1½"	As desired	225	360	3′	$6\frac{1}{2}$ 'x7' 3"	2650

SPECIFICATIONS OF STANDARD PIPE AND NIPPLE THREADING MACHINES

Туре	Size	Range	Chaser Equipment		P. M. ershaft		Floor Space		Approx. Net
Type Size		Nange	Chaser Equipment	Carbon Steel	H. S. Steel	Required			Weight Lbs.
Sin. Head Mach.	11/4" 2" 4"	18" to 12" 18" to 114" 14" to 2" 212" to 4"	1 set each 27, 18 and 14 Pitch. 1 set each 27, 18, 14, and 11½ Pitch. 1 set each 18, 14 and 11½ Pitch. 1 set 8 Pitch.	180 300 225 300	300 425 400 500	1' 2' 2' 3'	3"x5' 8"x7'	6" 1" 8" 1"	850 1400 2200 4650
Dou. Head Mach.	11/4" 2" 4"	18" to 12" 18" to 114" 14" to 2" 212" to 4"	2 sets each 27, 18 and 14 Pitch. 2 sets each 27, 18, 14 and 11½ Pitch. 2 sets each 18, 14 and 11½ Pitch. 1 set 8 Pitch.	180 300 225 350	300 425 400 550	2'10 3' 4' 8'	6"x5'	6" 1" 1" 2"	1400 2300 3800 7850

SPECIFICATIONS OF STANDARD PIPE THREADING AND CUTTING MACHINES

8" 216" to 8" 1 set each 8 Pitch and 8 Pitch. 225 400 9' 10"x4' 0" 10000	2" ½" to 2" 4" 1" to 4" 6" 1" to 6" 8" 216" to 8"	1 set each 14 and 11½ Pitch. 1 set each 11½ and 8 Pitch. 1 set each 11½ and 8 Pitch. 1 set each 8 Pitch and 8 Pitch	225 300 276	400 500 450 400	6' 9' 9'	8"x3' 10"x4' 10'x4' 10"x4'	2" 4" 4"	2650 6600 6600 10000
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THE GEOMETRIC TOOL CO.

NEW HAVEN, CONN.

CHICAGO OFFICES: 627 W. Washington Blvd.

Manufacturers of Threading Machines and Tools for Cutting all Classes of Screw Threads

"GEOMETRIC" is the trade name of the originators of Screw Thread Cutting Tools. Their manufacturers make nothing but Screw Cutting Tools and Machines. All the attention is given to the requirements of this important branch of manufacturing.

GEOMETRIC SELF-OPENING AND ADJUSTABLE DIE HEADS are adapted to practically all makes of screw machines and turret lathes.

MICROMETER ADJUSTMENT:

A feature of the Geometric Die Heads is the micrometer adjustment, by means of which quick and accurate variations may be made in the diam-



eter of the threads for a tight or loosefitting screw as desired. It also compensates for wear of the chasers.

ROUGHING AND FINISHING ATTACHMENT:

Where advisable to take two cuts, the roughing and finishing attachment provides a means whereby both cuts can be taken in less time than is required for one passage over and back of a solid die.

CHASERS OPEN AUTOMATICALLY:

The length of thread to be cut is accurately controlled by the chasers opening automatically when the required length has been threaded. With proper care the chasers will give long service and can be replaced at slight cost. Right or left hand threads, either standard or of special forms, may be cut. The form of the chasers and method of holding them is such as to permit of cutting threads flush to a shoulder, also of instant adjustment or interchange.

GEOMETRIC ADJUSTABLE COLLAPS-ING TAPS:



The mechanism of the Collapsing Taps is the same in principle as that of the Die Heads,

except that the action is reversed. In

accordance with the nature of the work to be tapped different forms of trips are fitted to collapse the chasers when the proper depth of thread has been reached. By use of extra sets of chasers the same Collapsing Tap can be used for varied diameters.

Collapsing Taps are adaptable to screw machines and turret lathes, also to a live spindle, such as a drill press. They are employed for tapping either straight or standard pipe thread sizes. Special Collapsing Taps are arranged for tapping fine pitch threads of short depth.

Where close work is required, the Collapsing Taps are fitted with a roughing and finishing attachment similar to that of the Self-Opening Die Heads.

GEOMETRIC THREADING MA-CHINES:



These machines are employed on a large class of small threaded parts that cannot be produced economically on the ordinary screw machine. Made in three sizes—to cut $\frac{1}{2}$ 6 to $\frac{1}{2}$ 6 inch, $\frac{1}{2}$ 6 to $\frac{1}{2}$ 7 inch, and $\frac{3}{2}$ 7 to $\frac{1}{2}$ 9 inch diameter threads.

The machine is equipped with a change speed gear for adapting the speed of the spindle to the diameter of work to be threaded. An adjustable stop gauges the length of the work and insures a uniform length of thread in every piece.

GREENFIELD TAP & DIE CORP'N

GREENFIELD, MASSACHUSETTS

Manufacturers of Screw Cutting Tools and Machinery, Gages, Reamers

NEW YORK OFFICE: 15 Warren St.

DETROIT OFFICE: 74 Congress St., W.

CANADIAN FACTORY: Greenfield Tap & Die Corporation, of Canada, Limited, Galt., Ont.



Our line of Tools and Machinery covers a broad field. We are essentially makers of Screw Cutting and Measuring Tools, but we make other Tools and Machines that are closely allied. A comprehensive list follows. We want to supply you with catalogs and booklets. Please state what you are particularly interested in.

GTD SCREW CUTTING TOOLS:

Taps:

For every purpose from watch-making to bridge building, including the shear-cutting "Gun" Tap.

Dies:

The "Acorn" Die and Holders, combining simplicity, accuracy and economy of operation. Also a wide variety of adjustable dies for hand and machine use. Ask for

Screw-plates:

More than one hundred different assortments of taps and dies to meet every possible requirement. In State Clause and "O K" style.

GTD GAGES:

Screw Thread:

Plug and Templet, Limit Snap Gages, New Limit Screw Pitch Gages, etc., made for all threads, forms and pitches.

Cylindrical:

Plug and Templet and Adjustable Limit Snap Gages in all sizes.

Special:

We design and manufacture Special Gages for any type and outline complete gaging systems for any product.

GTD REAMERS:

A complete line of reamers of all types, for hand and machine use.

GTD PIPE TOOLS:

Stocks and Dies:

The GTD Receding Pipe Threader with the quick release and quick reset.

No unwinding on the pipe or off. Capacity 1" to 2". TRIO and DUO Die Stocks "always ready" for work—no lost dies. Also complete tool sets.

Wrenches and Vises, etc.:

The **GTD** Pipe Wrench with the bull-dog grip, and a line of pipe tools that has always been in great demand.

GTD MACHINE TOOLS:

GTD Threading Machines:

Made in two different styles, capacities for bolt; sizes are ¼ to 1", ¼ to 1½" and ½8 to 2"; and Pipe Sizes ½8 to 1" and ¼ to 2", equipped with necessary Die Lands and corresponding sizes in Machine Nut Taps.

Nutter & Barnes Cutting Off Machines: 567

These are made in 5 sizes, capacities 0 to $4\frac{1}{2}$ "; 0 to $5\frac{1}{2}$ "; 0 to $8\frac{1}{2}$ "; 0 to 10" and 0 to 12", combined Saw Guard and Lubricating Device delivers large volume of cutting compound directly on the point of work, insuring faster speeds and feeds—smooth square surfaces. Machine is built to withstand heavy usage.

Lathes:

"Wells" Speed Lathes are supplied for floor and benchi—have special long adjustable taper bronze bearings with ring-oiling arrangement—made in 5 sizes—beds from 3'-0" to 6'-0" long.

Hand Screw Machines:

Have the same ring-oiler adjustable bronze bearings as the Speed Lathes—takes screw stock from 1/10 to 1/6 diameter—bed 3'-6' long—fitted with stock feed attachment.

"Wells" Cutter and Reamer Grinder:

Made in plain and universal types with self-aligning adjustable bearings—No. 190 Universal type has 8' diameter swing—16' between centers—length of table 26'—floor space 50' circle—special equipment.

NELSON-BLANCK MFG. CO.

FACTORY & MAIN OFFICE

1662 Dubois St. DETROIT, MICH.

EASTERN OFFICE
GRAND CENTRAL PALACE
NEW YORK, N. Y.

ADJUSTABLE DRILLHEADS:

TWO-SPINDLE adjustable heads are built in four sizes to take the following spindle equipment: Number 1-A Jacobs Chucks, Number 1, Number 2 and Number 3 Morse taper.

MULTIPLE SPINDLE heads for drilling holes equally spaced on a circle are built with 3, 4, 6 and 8 spindles.



6-Spindle Fully Adjustable Head

Fully Adjustable:

568

Our line of fully adjustable heads are designed for drilling holes of irregular spacing. These heads are built with 3, 4, 6, 8, 10 and 12 spindles and with number 1-A Jacobs Chucks, Number 1, Number 2, and Number 3 Morse taper in spindles.

Tapping:

Adjustable heads can be equipped with tapping arms, which are provided with independent reverse.



Fixed Center Head

Special Heads of all types and sizes built to order.



No. 02-2 Spindle Adjustable Head

Heads are held in position by means of a clamping ring, permitting the head to be clamped in any position desired.

Adapters and drivers are standardized making possible the changing of a head from one drill press to another by purchasing an additional adapter.

Mail us blue prints for quotation on suitable equipment. Descriptive matter mailed on request.

THE VAN DORN ELECTRIC TOOL CO.

Electric Tool Specialists

THE VAN DORN AND DUTTON CO.

Gear Specialists

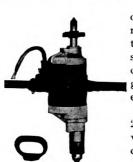
GENERAL OFFICES AND FACTORIES

CLEVELAND, OHIO

The erection of big new factories equipped with the latest machinery gives both Van Dorn companies excellent facilities for supplying the demand for their respective products.

Jan Dorn

"HARD SERVICE" (PORTABLE) ELECTRIC DRILLS AND REAMERS:



Made in various speeds for rapid production on bridge structural and reaming, general drilling. etc.

110-. 115-, 220-, and 230machines carried in stock.

The motors employed are of

the straight series type, designed to withstand a 50% overload. Ball bearings are used on both ends of the armature shaft, ball type thrust bearings, hardened and ground gears with accurately generated teeth, quick make-and-break switches, and forced lubrication in lower head.

DIRECT CURRENT MACHINES

Туре	Code	R.P.M.	Drilling Capacity	Reaming Capacity	Weight in Lbs.
D. C. 1	B-3600	550	1/2"		27 28
D. C. 2x	A-2100	600	5/8"	11 "	28
D. C. 2	20100	575	7/8"		45
D. C. 3	20000	700	114"	13 "	49
D. C. 4	1500	500	113"	116"	80
D. C. 4	A-1600	600	11/9"	15 "	86
D. C. 5	2800	300	2 "		107
D. C. 5	A-9200	425	2 "	15/8"	125

Supplied with cable ready to attach to line. 1/2" machines supplied with chucks when wanted.
5/8" machines and larger equipped with Morse taper sockets

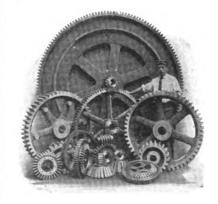
We also carry in stock universal machines for operation on D. C. and A. C. in 1/4", 5", 3/8", 1/2", 5/8" and 7/8" capacities.



GEARS AND GEAR CUTTING:

The Van Dorn & Dutton Co. specialize in gearing and are prepared to furnish complete, machine complete, or cut onlyto your specification-gears for machinery of every description, mine and mill service, 569 passenger cars, trucks, tractors, etc.

Our output includes spurs, bevels, spiral bevels, mitres, spirals, worms, racks, sprockets, Bakelite Micarta-D and rawhide pinions, etc.



An enlarged hardening and steeltreating plant is one of the features behind "Van Dorn" quality.

THE CLEVELAND TWIST DRILL CO.

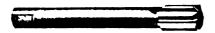
Established 1874

NEW YORK CITY 30 Reade Street

570

CLEVELAND, OHIO

CHICAGO 9 No. Jefferson St.



"PEERLESS" High Speed REAMERS (Patented):

have blades of high-speed steel united with the soft steel body by a patented process which produces a solid, one-piece reamer of unusual toughness, at an appreciable saving in manufacturing cost. This patented method of manufacture links in a single tool the toughness of a carbon reamer with the unique producing capacity typical of only the high speed tool. "Peerless" High Speed Reamers are especially recommended for machine reaming and are furnished in all styles, including expansion.



"PARADOX" ADJUSTABLE REAMERS (Patented):

combine many of the advantages of both solid and adjustable types. The body is of machinery steel, case-hardened where subject to wear, into which are inserted blades of tool steel. Taper-headed screws wedge these blades firmly against their backing, the blades being counter-sunk at intervals along the shoulder at their base to fit the taper screw-heads.

One of the screws is placed near the end of the blade, giving firm support where most needed, and preventing the tool from "hogging in." This construction gives all the rigidity of a solid reamer.



"PERFECT DOUBLE-TANG" SOCKETS (Patented):

have two driving slots instead of the usual one and afford a simple means of restoring old tools with broken tangs to their original usefulness. They "nest" and will fit any spindle or socket having a regular taper hole.



"PARAGON" DRILLS:

are not flat bars twisted while hot, but are twist drills forged from the original bar of high speed steel in special dies. This method produces correctly shaped flutes and toughens the metal. Especially designed for heavy duty drilling. They may be adapted to Morse standard tapers by means of special sleeves.

"EZY-OUT" SCREW EXTRACTORS: (Patented):



The only tool designed for the express purpose of removing broken set and cap screws, studs, pipe-fittings, etc. Made in 12 sizes. A valuable adjunct to every shop. Entirely eliminates the necessity of retapping and makes the removal of a broken screw a matter of a few moments only.

TRADE 🔷 MARK

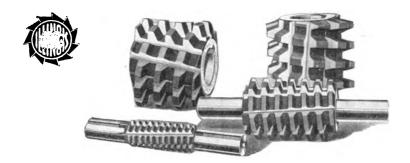
Catalog No. 319 Describes All "Cleveland"

DRILLS
REAMERS
COUNTERBORES
SCREW EXTRACTORS
SOCKETS
MILLS
MANDRELS
ARBORS
HIGH SPEED TOOLS

ILLINOIS TOOL WORKS

154 EAST ERIE ST., CHICAGO, ILL.

Manufacturers and Designers of Cutters, Hobs, Reamers



ILLINOIS HOBS:

Ground and Unground are manufactured for all standard makes of Hobbing Machines. Made of High Speed Steel unless otherwise specified.

It is not our ambition to make all the hobs used in industry: only to make the best.



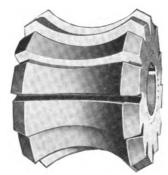
ILLINOIS HOBS are thoroughly inspected after each operation during manufacture, also before shipping. The inspection facilities for testing these hobs include machines and tools especially designed to detect any possible imperfections.

HOBBING PROBLEMS, submitted to the Illinois Tool Works, are solved by

experts. You are invited to avail yourself of their knowledge.

Illinois Tools Accurate—Dependable

Our engineering department offers a constructive service to plants with production problems, in the designing of tools to meet special requirements.



ILLINOIS TOOLS extend beyond the limits of utility and the restrictions of service; they are the expression of an industrial ideal. Every user of high speed tools should have our Catalog B.

When ordering Formed Cutters send drawing or sample of work.

Illinois Tool Works, Chicago, U.S. A.

GODDARD & GODDARD CO.

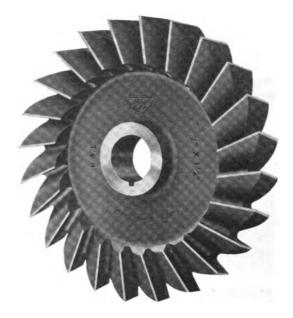
DETROIT, MICHIGAN

Manufacturers of Standard and Special Milling Cutters

TOOLS THAT



GO AND GO



572

HALF SIDE MILL:

The latest development in straddle milling cutters. Used singly or in gangs. A perfect combination of maximum chip clearance, maximum shearing action, maximum length of life, maximum heat treatment of the steel; putting it absolutely in a class by itself for maximum production.

It mills on a production basis heattreated alloy and other steels reading higher in Scleroscope and Brinnell values than is possible with other milling cutters.

This mill has teeth on the periphery and one side only, the teeth being on a spiral as well as undercut. This, com-

bined with the Go & Go patented tooth form, produces the easiest shearing action possible at the point of the tooth-just where the service required is most severe. In fact each tooth is nothing more or less than an ideal diamond point, removing its share of metal with the same ease and freedom that a diamond point properly ground and set in the toolpost of a lathe will do. Wherever straddle milling is done, we recommend a pair (right and left) of these half side mills and guarantee an increase in production of 25 per cent over the standard type of side mill and longer life between grinds. The ultimate saving to the user as compared to standard side mills is over 300%.

GODDARD & GODDARD CO.

DETROIT, MICHIGAN

Manufacturers of Standard and Special Milling Cutters

TOOLS THAT



GO AND GO



573

INSERTED TOOTH MILLING CUTTER:

The cutter illustrated herewith is the last word in inserted tooth mills.

The body is made of heat-treated alloy steel and has an elastic limit of about 100,000 lbs. It is thus able to withstand severe punishment.

The high-speed steel blades are set to have an undercut or rake and are held in place by the well-known wedgepin method. They are positively positioned laterally by dowel pins in the periphery. The blades have multiple notches cut in them so that when worn they can be reset, moving them laterally the distance from one notch to another, thus providing ultimate life to the teeth.

The cutters are made to be used in gangs (right and left) on arbors; or arranged to be bolted to flanged spindles such as are used on milling machines of various makes. They are recommended for work requiring cutters of 10 in. in diameter or larger.

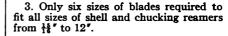
McCROSKY TOOL CORPORATION

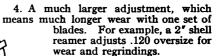
(Formerly the McCrosky Reamer Company) MEADVILLE, PA., U. S. A.

Manufacturers of Adjustable Reamers, Turret Tool Posts, Wizard Quick-Change Chucks and Collets, Wizard Variable Speed and Reversing Attachment for drill press, Searchlight Universal Lamp Brackets for shop and drafting room, Turret Tool Posts for Engine Lathes, Milling Machines and Other Cost-Cutting Specialties

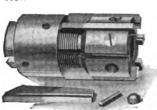
SUPER ADJUSTABLE REAMERS:

Give better results than solid reamers, will outwear them ten to one, and then the blades can be quickly renewed at small cost.





Hundreds of the best shops have adopted the SUPER as standard equipment. May we figure on your requirements also?



All sizes and styles from 15 to 12", High Speed or Carbon blades.

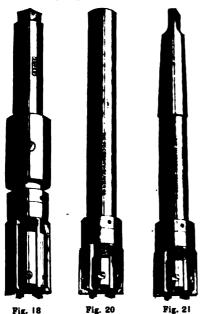
A number of exclusive features that put the SUPER almost in a class by it-

self:
1. A better and more rigid method of holding the blades in the reamer body. Practically a solid reamer when assembled.

2. Blades move FORWARD to be adjusted, a very superior feature.

WIZARD QUICK-CHANGE CHUCKS AND COLLETS:

Will revolutionize any drill press job where it is desired to use more than one tool in succession. Takes all sizes and kinds of tools, such as drills, taps, reamers, special tools, etc., in rapid succession without stopping the machine. On many jobs will show 50% saving. Embodies several important features not found in any similar





device. Wizard friction drive collets are unequalled for tapping and stud setting. Wizard No-Needa Tang collets reclaim broken tang drills and forever end all tang troubles.

Try a Wizard outfit on thirty days' approval and watch it make dollars for you. We take the risk.

Our complete catalog of cost-cutting tools sent on request.

MUMMERT-DIXON CO.

HANOVER, PA.

Manufacturers of Facing Heads, Portable Radial Grinders and Oilstone Grinders







Facing Head Applied to a Boring Mill, Milling Machine and Drill Press

MUMMERT-DIXON FACING HEADS:

The purpose of these facing heads, or turning tools, as sometimes called, is to produce work easily and rapidly, which heretofore, by ordinary methods, was difficult and slow. They can be used in connection with a bar on any machine or apparatus that will hold and drive the bar. The heads can also be used without a bar, on the end of a spindle, such as those of drill presses, milling machines, etc., by using an extra tapered shank. They are self-contained and easily overcome the difficulties caused by the old method of the flat spot-facing tools. The bits are removable and easily sharpened.

The smaller heads have one-way tool feed, two feed changes. The larger heads have two-way tool feed (from center out or vice versa) and four changes of feed.

Full descriptive bulletin mailed on request.

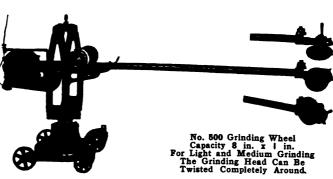
MUMMERT-DIXON PORTABLE RADIAL GRINDERS:

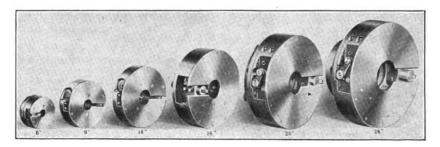
Will do 75 per cent. of all grinding that heretofore could only be done with a flexible shaft grinder, and can be done with greater ease and more rapidly.

When once in your shop it will be the most used grinder in the place. Why? Because it is light, easy to get to the work and the workman will like it.

They are made in three sizes with 8" x 1", 14" x 2" and 20" x 3" grinding wheel capacity.

Full descriptive bulletin mailed on request.





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THE NATIONAL TOOL CO.

CLEVELAND, OHIO

Manufacturers of Milling Cutters and Special Tools

CHICAGO OFFICE AND STOCK 26 South Jefferson St.

New York Sales Office 50 Church St.

ATLANTA SALES OFFICE 34 So. Forsyth St.

PHILADELPHIA OFFICE AND STOCK 40 North Seventh St.

DETROIT OFFICE & STOCK, 610-611 Sun Bldg.

NATIONAL CLEVELAND MILLING CUTTERS are widely known for their



serviceability and economy. The line is complete, being increased to include new tools whenever the need is recognized. The following list covers the types in general demand and are usually carried in stock. We are fully equipped for the manufacture of

any special types of cutters or similar tools in large quantities. Send drawings or complete specifications for prices.

Angular Cutters

Double

For Spiral Mills

Concave Cutters with Form Teeth Concave Cutters

Corner Rounding Cutters

Convex Cutters with Formed Teeth

576 Convex Cutters with Milling Cutter Teeth

Counterbores

Cutters for Making Twist Drills

Cutters for Grooving Straight Lipped Twist Drills

Cutters for Making Four Lipped Twist

Cutters for Fluting Reamers

Cutters for Grooving Taps Cutters for Grooving Taps and Reamers



End Mills-Taper Shank

Shell

Keyway Straight Shank

Gear Cutters—Involute Metric

Bevel or Mitre

Hobs-

Spur or Spiral Gear & Worm Wheel

Hollow Mills-Adjustable

Inserted Tooth Cutters-Face Milling Cutters

Side Milling Cutters

Keyway Cutters-Woodruff

Metal Slitting Saws

Milling Cutters-Nickela Tooth Plain Milling

Side Milling Interlocking Side

Milling





Sprocket Cutters— For Block Center Chains For Roller Chains Stocking Cutters for roughing gear teeth Tee Slot Cutters Thread Cutters, single and multiple styles

THE NATIONAL-CLEVELAND IN_ TERCHANGEABLE COUNTERBORE AND SPOT FACER:



Both types of cutters and all parts are interchangeable.

Holders are made of the very best material.

Cutters of High Speed Steel. Pilots of Tool Steel hardened and

The hole for the Pilot in both the Cutter and Holder is ground to insure a good fit for the Pilot Shank. The Pilot is held in place by a Set Screw. The Cutter is screwed on the Holder and does not depend upon the Pilot for drive.

NATIONAL-CLEVELAND JUSTABLE CYLINDER REAMER:



For the Proper Finishing of Engine, or Similar Cylinders without Grinding:

We have designed a special line of reamers for the proper sizing and finishing of engine cylinders and without grinding, the required glass smooth finish can be obtained.

We recommend as a complete outfit two roughers and one floating finisher. The construction of the roughers is the same as the finishers except the floating action is not required. We are prepared to make up these reamers for any size cylinder from 214" in diameter up and with shanks or special arrangements for driving to fit various types of drill presses, boring mills, etc.

JOSEPH T. RYERSON & SON

Established 1842

Incorporated 1888

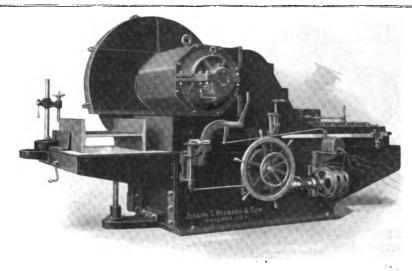
CHICAGO

St. Louis

DETROIT

BUFFALO

NEW YORK



Ryerson Patented Universal High Speed Friction Saw No. 4

577

HIGH SPEED FRICTION SAWS:

The leading Mechanical Engineers and Shop Managers acknowledge the many advantages which the High Speed Friction Saw has compared with slow speed cold saws and beam shears. This is evidenced by the installations in many large shops throughout the country.

Uses: The Ryerson High Speed Friction Saw is being used by the leading bridge and structural plants in this country and abroad, by shipbuilding plants in the cutting to length of structural shapes, by frog and switch manufacturers, and the railroads in reclamation work of old rail sections.

In addition to the above classes of cutting work this saw will cut round and square bars when used with the Ryerson Patented stock chucking and rotating device.

The Machines Are Made in Four Sizes

No. 1 Capacity, 12" Beam sections

No. 2 Capacity, 18" Beam sections

No. 3 Capacity up to 24" Beam sections

No. 4 Capacity, The heaviest sections rolled including Bethlehem Sections

These machines will also cut various other structural shapes and bars with equivalent cutting area.

Time Saving: The Ryerson High Speed Friction Saw will cut material in a small fraction of the time required in cutting by any other means. The average time for cutting, when all sections are considered, is less than 40 seconds per cut. Rails, Beams, Angles, Channels and Bars, etc., may be cut in immediate succession without any adjustment of the machine.

Power Consumption: Entire absence of belts, gears, fly wheels, etc., permits operation at the highest efficiency and at much less expense than other machines of same capacity.

HUTHER BROS. SAW MFG. CO.

ROCHESTER, N. Y.

Manufacturers of Patent Inserted Tooth Milling Saws, Hack Saws, Circular and Band Saws for Cutting Wood and Metal, Special Cutters, Discs, Knives and Patent Groovers



HUTHER BROS. PATENT INSERTED TOOTH MILLING SAW:

Thin-Free Cutting-Strong-Flexible

578 Two toughly tempered crucible steel plates firmly riveted together form the body of this saw.

The teeth or inserts are of the finest quality high speed steel and are formed so that grinding or sharpening is done on face of tooth only. This not only insures an easy and quick method of sharpening, but a tooth of great strength and long life as well.

The speed of this saw is recommended at from 35 to 55 peripheral feet per minute, feeding against the stock at the



Front View of Teeth
Showing round top and square top teeth in the different heights

rate of ½" to 2" and over per minute, according to the nature of the stock and the capacity of the machine.

The teeth have large throat room and ample clearance on both sides and back and are guaranteed to be free cutting and to require the minimum amount of power to operate.

The round top tooth is about \$\frac{1}{64}\$" higher than the square tooth and acts as a roughing tool, taking the chip from the center. The square tooth following removes the chips from either side of the cut. This breaking up of the chips, together with the double clearance of the square tooth, eliminates the possibility of this saw clogging, when cutting soft, stringy stock.



Another View of the Two Teeth
Showing the rivet holes and side and back
clearance

List showing thickness or kerf of saws: 14" diam. $\frac{3}{16}$ thick; 18" diam. $\frac{7}{32}$ thick; 26" diam. $\frac{1}{4}$ thick; 30" diam. $\frac{9}{32}$ thick.

Fine Pitch: We also manufacture this saw with close pitch tooth, 3%" to about 3%" space from point to point. This is not a formed tooth and is not recommended except in cutting small diameter stock, structural steel, rails, etc.

For stock 2" or over, coarse pitch type gives the best results and can be depended upon to give the greater output.

Write for our Catalog.

SIMONDS MANUFACTURING CO.

FITCHBURG, MASS.

CHICAGO, ILL NEW ORLBANS, LA. NEW YORK CITY SEATTLE, WASH. LOCKPORT, N. Y. MEMPHIS, TENN SAN FRANCISCO, CAL. PORTLAND, ORE.

Montreal, Que. Vancouver, B. C. St. John, N. B. London, England

Manufacturers of Saws, Knives, Files, Steel

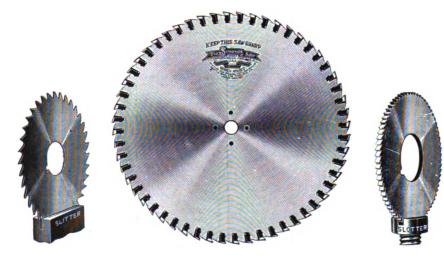


579

SIMONDS METAL CUTTING SAWS:

We make Metal Cutting Saws, Slitting Saws and Screw Slotters for any make of machines. Simonds Hack Saw Blades, hand or power, and Simonds Files are carried in stock by the Hardware Dealers in your city.

When ordering Simonds Metal Cutting Saws please specify: Diameter, Thickness, Hole, Pin Holes, Material to be cut, Number of Teeth, Solid or Inserted, Make of Saw, Make of Machine.



THE L. S. STARRETT COMPANY

ATHOL, MASSACHUSETTS

New York Store 90-92 West Broadway LONDON WAREHOUSE 36 and 37 Upper Thames St., E. C. CHICAGO STORE 17 No. Jefferson St.

Manufacturers of Fine Mechanical Tools

STARRETT TOOLS:

Calipers Pocket Slide Vernier

580

Of all the different kinds and sizes of tools which comprise the Starrett line, there is not one but was added to fill a specific need of men who work metal to precision measurements. Utility, accuracy and a uniform quality characterize every Starrett Tool.

Center Tester, Punches Clamps Key-Seat Measuring Bar Parallel, Rule, Steel Countersinks Dividers Draftsmen's Tools Drill Blocks Gages
Bench, Button, Cal.
Center, Circum
Depth, Vernier
Drill, Tap, Wire
Fillet or Radius
Height, Vernier
Hub, Inside Caliper Inspectors Micrometer Caliper Micrometer Depth Planer and Shaper Scratch, Sc. Pitch, Sole Stair, Surface, Taper Telescoping Thickness Ground Flat Stock Hack Saws and Frames Inclinometers

Jack Screws

Leveling In Instruments Loco'tive Guide Liner Micrometers, In., Out. Nail Sets, Pin Vises Pliers Plumb Bobs Protractors Bevel, Draftsmen's Patent, Univ. Bevel End Measuring Rods Rules Folding, Shrink. Slide Scrapers Combination Sets Sets of Tools Speed Indicators Squares Caliper, Carpenters', Center Combination, Die Makers' Double, Dftmen's T Graduated Hardened Hardened Edge Micrometer Caliper Try, Special Std. Thin Steel Straight Edges Steel Tapes

Test Indicators

Trammels

Transits

MICROMETER CALIPERS:



Made in all sizes from ½ inch to 12 inches and graduated in both metric and English systems. Furnished with or without standards and with or without lock nut and ratchet stop as desired. All measuring surfaces and bearing parts are hardened. Smaller sizes may be had to measure in ten-thousandths of an inches, or they may be had for any size up to 6 inches, or they may be had in sets with or with-

out velvet-lined morocco leather case. The Starrett line includes standard size micrometer calipers, heavy, screw-thread, hub, paper gage, U. S. Gov't, bench and inside micrometer calipers, micrometer caliper heads and special purpose micrometers and attachments. Catalog of tools sent to any address on request.

STARRETT HACK SAWS:

Are made of the finest grade of tungsten steel, found after exhaustive experiments to be best adapted to the purpose.

The teeth are sharp, with square cutting points, set evenly and in such a manner that every tooth cuts. The set is just enough to insure a free, smooth, and rapid cut, removing no more stock than necessary. The saws are tempered by our improved process, which leaves them hard and tough, so that they will not shell off," and are uniform in temper. They are too hard to file. All saws are hardened throughout, except the flexible back saws. Every saw is guaranteed to be of the best quality and adapted to most economically meet the requirements of the class of work for which it was designed.

The Starrett system of selecting saw blades according to the physical and chemical characteristics of the substance to be cut, is founded on the results of experiments conducted by engineers and tests made in our own shops, and its economy of time, material and blades has been proven repeatedly. The Starrett recommendation is not for a multiplicity of blades, but rather for the wise selection of a comparatively small number of saws, each of which will cut a wide range of materials most economically. Thus, according to The Starrett Hack Saw Chart, we find a total of three blades recommended for light Hack Saw Machines; four for the medium and heavy machines; three for the extra heavy power work, and six for hand work, including sheet metal.

STARRETT HACK SAW CHART:

MATERIAL		Blade for Frame			Blade for Machine	
TO BE CUT	All Hard	Fiexible or Soft Back		Medium Machine	Heavy Machine	Extra Heavy Machine
Light Angles Channels Tee Iron Ornamental	102	252	115	262		
Heavy Angles Channels Tee Iron	103 112	250	115-B	255		
Light Structural	112-B	250-B	115-B	255	254	256
Heavy Structural	112-B	250-B	114	255-B	254-B	256-B
Rail Cutting	112-B		114	255-C	254-C	256-C
Steeland IronPipe Conduit and Brass Pipe	102	252	115	262	259	
Solid Stock Cold Rolled Machine Steel	103-B 112-B		114	255-B 255-C	254-B 254-C	256-B 256-C
Tool Steel (103 112		114	255	254	256
Brass (103 112		115	262	259	
Sheet Metal and Tubing Less than 18 gage, Over 18 gage	253 102	258 252				

Numbers above are those given in the Starrett General Catalog and on house containing the blades

VICTOR SAW WORKS

SPRINGFIELD, MASS.

Manufacturers of Hack Saw Blades



VICTOR HACK SAW BLADES:

Are made from Victor Special Private Formula Steel, a semi-high speed alloy of extreme toughness. Every blade is carefully milled, not punched, and is scientifically hardened, not surface burnt. The teeth are set by our Victor patented shear set. Every tooth a perfect cutting tool.

To get 100% efficiency care should be taken in selecting the right blade, and there is a Victor blade for every purpose. This does not mean a confusing number of blades for we have carefully worked out by experiment and test the best blade for each kind of work.

Regular stock blades always furnished when length only is specified.

The superiority of Victor Hack Saw Blades is due to their being a quality product throughout. The highest quality of materials, up-to-date methods of manufacture and rigid inspection-all along the line-combine to make Victor quality.

	For Cutting	Regular Stock Blade For General	Soft Steel	Tool Steel Hard Metah	Brass Copper Drill Red Iron Pipe	Thin Tubing Electric Casing	List Price
		All- Round Work	Cast Iron	Light Angle Iron	Sheet Metals	Thin Sheet Metals	
	Size		т	seth per	Inch	Pipe	Per
8"	× 14 × 0 024		18	18	24		8.00
9"	X 1/4 X 0.025		18	18	24		9.00
10,	X 14 X 0.025		14	18	24		10,00
	X 1/4 X 0.025				24		12 00
12°	X A X 0.02		14	18	٠٠.		12.00
_	X 1/4 X 0.021		14	18			12.60
14'	X 1/4 X 0.021	14	14	18	L		16.20
	HA	ND-	FLEX	IBLE	No. 2	2	
8° 9°	X 14 X 0.025	18	18	18	24	32	8 00
9"	× 14 × 0.025	18	18	18	24	32	9.00
10*	X 1/4 X 0 02		14	18	24	32	10.00
12"	X 16 X 0 025				24	32	12.00
	X & X 0 02		14	18			12 00
14"	X % X 0 021	14	14	18	1	1	16.20

HAND SPECIAL For Hard High Carbon Rails 581

Length. 12 inches Price, Special AA, No. 1, 14 and 18 Teeth per gross, \$12.00

All lengths given for hand blades measure from center to center of holes.

MACHINE—ALL HARD No. 4 For Light Power Machine Work

Por Cutting	Regular Stock Slade For Ceneral All- Round	Steel Rolls Ameraled Tool Steel Heavy Augle Trou Soft Steel Cast Iron	Light Augie Iron Iron Pipe Bruss Copper Tool Steel	Heavy High Machines Run with C Solution Machine Steel Heavy Augle Iron		Llet Price
	Work	Bronze	Hard Metals	Large Work	Small Work	
Sire			Teeth per In	ch		9.00
10° X % X 03		14	18	· · ·		18.5
13 × 14 × .03		14			• • •	14.4
. IX X X 01		14	18			16.9
14. X X X 03		14	L HAI	<u></u>		18.9
			r Mach	ine W	ork	
10" X 14 X .UV		10	14			19.54
X X X .04		10	14	٠٠.	ı	29.40
12° X 1 X .040 X 1 X X .040				1 '2	l :	27 2
X X X .00	iä	10	14		ا ا	27.3
14° X 1 × 04		10	14		انتا	24.3
X 134 X .04					1 1	44.10
6" X 1 X .04	i io	10	14		!	30.20
X 1 X .04	10	10	14		1	41.64
X 1K X .64						\$3.5
∵ x 1 x .044	10	10		8	10	\$3,54
X 15 X .06	9	• • •		•	8	86.00
X 1 X .041	10	10	10	1 :		44.10
18° X 116 X .041		:: :	::	•	•	86.70
X 1 X .06		10	10			84.70 63.00
	at ' I	10	10		l : l	99.00
X 1K X 04	انتا	10		•		75.00
X 14 X 083	3 "	.0		نه ا	'i	190.00
1 × 1 × 1 × 100		لصننصا				

Lengths of No. 4 power blades measure from center to center of holes, excepting 14 and 17 inch lengths; these measure 13½ and 16½ inches. When length only is specified, we will furnish power blades in all lengths up to and including 14 inches, .032 inch thick. Longer engths up to 24 inches, .049 inch thick; 24 inches and longer, .065 inch thick.

NORTON COMPANY

WORCESTER, MASS., U. S. A.

NEW YORK STORE 151 Chambers St. **Blectric Furnace Plants** NIAGARA FALLS, N. Y .- CHIPPAWA, CAN.

DETROIT STORE 233 West Congress St. Bauxite Plant BAUXITE, ARK.

CHICAGO STORE 11 N. Jefferson St. Manufacturing Plant WORCESTER, MASS

Manufacturers of Alundum and Crystolon Grinding Wheels, Alundum and Crystolon Grain for Polishing, Alundum Refractories and Laboratory Ware, Glass Cutting Wheels, Sharpening Stones, Scythe Stones, Rubbing Bricks and Stones, Grinding Wheel Dressers and Grinding Machinery

TRADE

Norton



(Al₂O₃) is an artificial abrasive, the hardness, sharpness and toughness of which are under control during manufacture. This, in combination with its characteristic conchoidal fracture, makes Alundum Grinding Wheels particularly effective upon materials of high tensile strength—notably steel and its alloys.



(SiC) is another product of the electric furnace and because of its wonderful purity and remarkable cutting qualities, combined with its greater brittleness, this abrasive has proved highly efficient in grinding cast iron, brass, bronze, aluminum, glass, marble, pearl and materials of like physical characteristics.

NORTON GRINDING WHEELS:

Are made by four processes—the vitrified, silicate, elastic and rubber. In the vitrified process, the principal bonding ingredient is clay; in the silicate, sodium silicate is largely used; in the elastic process, the bond is made from a special mixture of shellac and other ingredients; while in the rubber process, a special form of vulcanized rubber is utilized.

Wheels can be furnished in various shapes and wheels can be turnshed in various shapes and sizes to meet grinding requirements. Sizes run from as small as \(\frac{1}{2} \) diameter to as large as \(\text{60}'' \) diameter, while the thinnest wheels made are \(\frac{1}{2} \) "thick, and the widest faced \(28'' \) thick. All wheels larger in diameter than \(5'' \) are subjected to a severe mechanical test before shipment to bring out any inherent weakness.

Wheels are classified by grain and grade, the grain numbers indicating the size of the abrasive cutting particles, and the grade denoting the measure of strength of the bond, or binding material in the wheel which holds the grain in its setting.

GRAIN FOR POLISHING:

Alundum and Crystolon grain are used extensively for polishing many kinds of material. Alundum grain is particularly efficient on steel and other metals of high tensile strength.

REFRACTORIES:

Owing to the high refractory properties possessed by Alundum this substance has been found unequalled for the manufacture of refractory and laboratory ware. Alundum is made into electric furnace cores, tubes, muffles, crucibles, com-bustion boats, filtering crucibles, cones, extraction thimbles and refractory cements.

SPECIAL RESEARCH SERVICE:

We have well-equipped research laboratories with a competent staff of research engineers and demonstrators who are always ready to give you the benefit of their special knowledge and wide experience in the solving of your special problems.

Any of these Booklets will be sent upon request:
Grinding Wheel Catalog
Alundum—Crystolon Booklet
Polishing—What to Use—How to Use It
Norton Refractories—Alundum and Crystolon
Saw Sharpening.

Saw Sharpening
The Grinding of High Speed Steel

The Grinding of High Speed Steel
Tool Grinding
Safety as Applied to Grinding Wheels
Grinding Wheel Dressers
Alundum and Crystolon in the Glass Industry
Bushing Grinding Wheels
Little Known Facts about Grinding
Grain and Grade as Applied to Grinding

Wheels Cam Grinding and Cam Grinding Equipment A Treatise on Dynamic Balance Principles of Cylindrical Grinding Storage, Handling and Supervision of Grinding

Wheels

How To Order Grinding Wheels Balancing of Grinding Wheels

Balancing of Grinding Wheels
Balancing of Grinding Wheels
Commercial Diamonds
Grinding Wheels on the Blanchard Surface
Grinding Machine
Grinding Wheels on the Pratt & Whitney Surface Grinding Machine

Snagging

THE STERLING GRINDING WHEEL COMPANY

TIFFIN, OHIO, U. S. A.

CHICAGO HOUSE 30-32 N. Clinton Street NEW YORK The L. Best Co., 28-30 W. Broadway Selling Agents

Grinding Wheels and Machinery



A GRINDING WHEEL FOR EVERY PURPOSE:

Sterling Wheels are made by three processes, Vitrified, Silicate, and Elastic.

The Vitrified process is the usual bonding in clay. The Silicate process has Sodium Silicate as its base. The Elastic process is a special bonding material made up of Shellac and other ingredients.

Sterling Wheels will be furnished in any standard shapes, made by any of the

several processes used, and from the best kinds of material which are to be had at the present time.

GRINDING MACHINERY:

We aim to furnish anything that is needed in the Grinding line and will be glad to have your inquiries and specifications. Prices are right. The goods are right. And Sterling Machinery will please you,

WALTHAM GRINDING WHEEL CO.

WALTHAM, MASS.

Manufacturers of Grinding Wheels

WALTHAM GRINDING WHEELS:

It is the verdict of those who knowgrinding machine operators—that for cool cutting qualities Waltham wheels are unsurpassed. They are human in that respect. Like good workmen, they do their jobs smoothly and efficiently because they keep cool.

Furthermore, Waltham wheels are distinctive because of their peculiar adaptability. "Mating" the wheel to the 584 work is an art for which 40 years' training in the school of experience has well equipped the Waltham Company.

> We make three types of wheel: CARBOWALT, ALOWALT and SPECIAL ALOWALT. For materials of low tensile strength we recommend Carbowalt; for those of high tensile strength, Alowalt; and for the same when hardened, Special Alowalt.

> Waltham wheels are manufactured by SILIthree processes: VITRIFIED, CATE AND ELASTIC.

> The chart in the next column gives an idea of the types made by each process and the particular uses of each type.

VITRIFIED

24-S for Snagging Iron Castings 36-K for Grinding C. I. Pistons 36s-J for Automobile Cylinders 30-Q for Brass Castings

811-S for Snagging Steel Castings 30-S for Roughing Camshafts 30-Q for Annealed Malleable Iron 36-I for Surfacing Machine Steel

Special Alowalt

346-L for Hardened Motor Shafts 46-M for Saw Gumming

46-K for Internal Grinding Hardened Steel

46-I for Surfacing Novo Steel

SILICATE

80-O for Pocket Knife Blades 30-O for Lathe & Planer Tools 16-L for Surfacing Guide Bars 80-M for Fluting Drills

30-J for Surfacing Hardened Washers 60-J for High Speed Cutters 36-G for Surfacing High Speed Steel 30-L for Planer Knives

ELASTIC

60-31/2 for Cutting off Brass Tubing 36-31/2 for Cutting off Sand Cores 30-31/4 for Aluminum Castings 24-334 for Coping Marble

46s-334 for Cutting off Hardened Stock 60-334 for Cutting off Soft Stock 80-31/2 for Burring Small Gear Teeth 30cb-314 for Finishing Camshafts

60-112 for Chilled Iron Rolls 6789-31/2 for Finishing Ball Races 120-214 for Centerless Grinding 60-21/2 for Sharpening Cutters

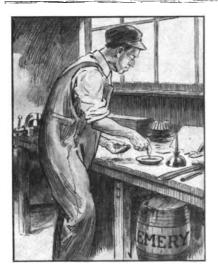
CLOVER MANUFACTURING CO.

903 Main Street NORWALK, CONN.

CHICAGO

SAN FRANCISCO

Manufacturers of Clover Lapping, Grinding, Polishing and Surfacing Compounds



The Expensive Way

Which Method Is Used in Your Lapping, Grinding, Polishing, Surfacing?

Time was when an abrasive powder and oil was the only method of lapping.

Elliptical holes, uneven surfaces were the despair of the mechanic, for the oil would run away—and you know what happens when the abrasive dries under the lap.

And what mechanic was there who did not "mix up" more than he needed. Result—waste of material, time, energy, and increased costs.

Your time in mixing up the powdered abrasive and oil is worth more than the entire cost of Clover Lapping and Grinding Compounds that you would use on any job.

Clover Lapping Compound is ready for use as sold. It is absolutely uniform, because it is scientifically mixed—the



The Clover Way

correct quantity of abrasive and our special grease binder.

Clover always remains on the lap whether it is lapping thousandths in gauge, die or jig work, or hundredths in big heavy jobs.

And there are seven different grades of Clover, from very fine cutting to extra coarse—a correct grade for every class of work.

There is no waste with Clover—the cost is less—results always uniform and satisfactory.

We want to make you acquainted with the qualities that have made Clover the largest selling, grinding and lapping compound in the world—4,000,000 cans sold in 1919.

Samples of all grades from very fine to extra coarse upon request. Try them, see what they can do under your own conditions.



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THE HOGGSON & PETTIS MFG. CO.

NEW HAVEN, CONN., U. S. A.

Manufacturers of Lathe Chucks, Special Tools and Machinery, Rubber Mfr's Supplies, Roll Engraving, Etc., Cutting Dies, Steel Stamps

THE SWEETLAND INDEPENDENT CHUCKS:

PRICE LIST, DIMENSIONS, ETC.

Code	Size In.	Size of Hole Inches	Diameter of Recess for Face Plate, In.	Weight Lbs.	Price
fable	41/2	1	41/8	7	\$20.00
fabric	6	11/2	55/8	12	22.00
facade	8	13/4	43/4	28	26.00
facile	9	134	55/8	32	28.00
facet	10	21	55/8	42	30.00
faction	12	25/8	611	67	35.00
faculty	14	3	6#	84	40.00
fagot	16	3	7 14	117	46.00
faith	18	4	91/2	157	54.00
falcon	20	41/6	91/2	184	62.00
fame	22	5	11	217	70.00
fancy	24	5	11	267	80.00
fashion	26	4½ 5 5 5	12	315	93.00
fastness	28	5	13	350	110.00
argon	30	6	15	430	130.00





586



DIMENSIONS OF ALL GEARED SCROLL CHUCKS Numbers 6, 60, 61, 62, 63, 64, 65 and 66

Size	Wei App I Set	ght rox.	Gro Wei App 1 Set	ght	Ja	et ight ws Set	of Hole	Diameter of Recess Face Plate	Hold	Diameter of Swing
3	3 Jaws	4 Jaws	3 Jaws	4 Jaws	3 Jaws	4 Jaws	Size	Diame of Rec for Face	Will	Dian
3			31/2	4			3/8	211	31/4	3%
4	71/4	71/4	71/2	71%	3/4	1	1	3	43/8	43/4
5	10%	11	11	111/2	1%	134	11/4	3#	51/2	51/2
6	16%	16%	1734	171/	134	3	12	4%	634	61%
71	26	281/2	29	311/	3	4	2	434	81/2	81/8
9	38	40	41	461/	31/4	51/2	23/2	5	101/2	10
10%	53	53 1/2	61	61 1/2	51/2	71/5	3	57%	111/	11%
12	69	731	81	85	8	111%	31/2	611	13	121/2
15	114	117	128	131	8	12	31/	611	16	15%

COMMON REVERSE REVERSIBLE Jaws are Styles Nos. 61 and 62 Jaws are Styles Nos. 63 and 64 Jaws are Styles Nos. 6 and 60

	Three Jaw Chucks Styles Nos. 61, 63 Four Styles			Jaw (s Nos.	62,	cks 64	
Code	Size		Price	Code	Size	e	Price
inhale	3	in.	\$17.00	inland	3	in.	\$19.00
inlet	4	in.	19.00	inmate	4	in.	21.00
install	5	in.	21.00	inmost	5	in.	23.00
issue	6	in.	24.00	indorse	6	in.	27.00
inward	71/2	in.	27.00	induce	71/2	in.	30.00
inveigh	9	in.	33.00	indulge	9	in.	36.00
insect	101/2	in.	38.00	incense	101/2	in.	42.00
insight	12	in.		india	12	in.	
insipid	15	in.		indigo	15	in.	65.00

TWO SETS OF JAWS ARE STYLES No. 65 and 66

Three Jaw Chucks Style No. 65				Four Sty	Jaw (le No		
Code	Size	•	Price	Code	Size		Price
inject	3	in.	\$20.00	incase	3	in.	\$22.00
insist	4	in.	22.00	inboard	4	in.	24.00
instep	5	in.	24.00	incage	5	in.	27.00
iris	6	in.	28.00	incise	6	in.	31.00
invest	71/2	in.	32.00	inclose	71/2	in.	36.00
inverse	9	in.	38.00	incline	9	in.	42.00
intrude	101/2	in.	44.00	incrust	101/2	in.	49.00
inform	12	in.	52.00	incur	12	in.	58.00
inflict	15	in.	70.00	incurvate	15	in.	76.00

THE HOGGSON & PETTIS MFG. CO.

THE SWEETLAND COMBINATION LATHE CHUCKS:



WITH REVERSIBLE JAWS

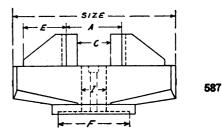


WITH COMMON JAWS

SWEETLAND BOX BODY CHUCK:



Can Be Furnished as Universal or Independent. Slip Jaws, Tool or Soft Steel



Front Blevation Box Body Chucks

BOX BODY CHUCKS

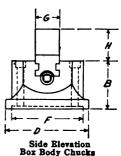
These Chucks Can Furnished from Stock with Three or Four Jaws as Desired

Size	Weight each	A	В	С	D	E	F	G	н	I	Code	Price
In. 7 9½ 12 15 18	20 lbs. 38 lbs. 50 lbs. 75 lbs. 100 lbs.	3 4 6	In. 3 3 4 4 4 4 4 1/2	4 6	4 1/2 55/8 6 73/4	2	In. 311 434 5 611 611	134	In. 1 1/4 2 1/4 2 3/4 3 1/2	In. 134 2 214 214 214	eared earl earth easel eavse	\$28.00 33.00 40.00 50.00 75.00

COMBINATION LATHE CHUCKS

Size	Net Wt. Approx.			Gross Wt. Approx.		Hold	Size	ameter Recess r Face	Price	Lists
°	3 Jaw	4 Jaw	3 Jaw	4 Jaw	Diameter of Swing	Will	S	Diam of Re for F	Three Jaw	Four Jaw
In.	Lbs.	Lbs.	Lbs.	Lbs.	In.	In.	In.	In.		
6	20	21	23	24	8	61/2	11/4	3 🚜	\$35.00	\$42.00
9	33	36	41	44	101/2	91/2	11%	5	45.00	
12	60	65	73	78	1334	1214	134	51/8	56.00	
15	80	84	94	98	1614	1514	134	51/8	70.00	82.00
18	110	116	129	135	19	181/2	2	9	87.00	102.00
21	125	147	148	168	223/4	211/2	21/4	9	110.00	130.00
24	145	162	170	187	2534	24 1/2	21/2	9	136.00	160.00
30	332	383	379	430	32	3014	416	121/6	200.00	240.00
36	465	529	484	540	381/2	3614	41/2	1214		325.00
42	610	640	675	700	44 1/2	421/2	41/2	24		450.00

(Continued on next page)



(Continued from preceding pages)

THE HOGGSON & PETTIS MFG. CO.

NEW HAVEN, CONN.

HAND CUT STEEL LETTERS AND FIGURES:



The proper grade of steel is used in the construction of these hand cut steel figures and letters. A size suitable for the letter to go on it is used and is long enough so it can be held without hitting the fingers.

	1 1		
Size,	Price	Price	Price
Inch	Figures,	Letters,	Letters
	per set	per set	or
	Set	set	Figures, each
1-64	\$8.00	\$24.00	\$1.00
1-32	5.00	15.00	.70
1-24	4.50	13.50	.60
1-20	4.50	13.50	.60
1-16	3.50	10.50	.50
1-12	3.50	10.50	.50
3-32	3.50	10.50	.50
1-10	3.50	10.50	.50
1-8	3.50	10.50	.50
5-32	4.00	12.00	.60
3-16	4.50	13.50	.60
7 - 32	5.50	16.50	.70
1-4	5.50	16.50	.70
5-16	6.50	19.50	.80
3–8	8.00	24.00	.90
7-16	9.00	27.00	1.10
1-2	11.00	33.00	1.30
5.8	15.00	45.00	1.70
3-4	19.50	58.50	2.30
7-8	25,00	75.00	3.20
1	31.50	94.50	3 60

HAND CUT STEEL STAMPS:



Of all kinds and for all purposes. The work is all strictly hand cut, the letters being correctly shaped and the stamps properly tempered to suit the work they are to do. Price list is for plain letter hand stamps only.

Size, Inch	Price per Letter	Size, Inch	Price per Letter
17/24	.70	1,2	.70 .70
1/20 16	.60	7 ,	.80
1/12 32 1/10	.50 .50 .50	178 172 5%	1.10 1.30 1.70
1/8	.50	24	2.30 3.20
**	.60	î	3.60

Stamps with letters over 1/8 inch will be charged extra at the rate of 100 cents per pound for steel and forging.

MARKING ROLLS AND MACHINE STAMPS:



Estimates cheerfully given for machine stamps and marking rolls, completing or for cutting same only. Also for fancy lettering and special designs; stamps for difficult places and shapes.

THE E. HORTON & SON COMPANY

WINDSOR LOCKS, CONN., U. S. A.

Manufacturers of Chucks

HORTON IRON BODY INDEPEN-DENT CHUCK:

Important features of this chuck are:

Large diameter screws with mortise end for operating wrench.

Hardened steel thrust bearings held



Model 50

absolutely rigid in chuck body.

Thrust bearings placed near the outer end of screw where they are better protected from the chips.

LIST PRICES. MODEL 50

Rated Size, In.	List Price	Rated Size, In.	List Price
4 in.	\$20.00	22 in.	\$70.00
6 in.	22.00	24 in.	80.00
8 in.	26.00	26 in.	93.00
9 in.	28.00	28 in.	110.00
10 in.	30.00	30 in.	130.00
12 in.	35.00	32 in.	155.00
14 in.	40.00	34 in.	180.00
15 in.	43.00	36 in.	210.00
16 in.	46.00	38 in.	245.00
18 in.	54.00	40 in.	280.00
20 in.	62.00	42 in.	320.00

HORTON GEARED SCROLL UNIVERSAL CHUCK:

The new Horton Geared Scroll Chucks geared Scroll Chucks are of the solid body pattern—the body being of double U sec-tion giving unusual stiffness. The jaws are locked deeper into chuck on ribs much wider than heretofore used



The Gearing is much

improved, having stronger tooth shapes specially designed for this line of chucks. Horton Scroll chucks are carefully made to gauges so that at any time extra sets of finished and the stronger to the first of the stronger to the stronger jaws or blank soft jaws can be furnished which will interchange.

LIST PRICES-MOD. 34-C AND 44-C

Rated	3-Jaw	4-Jaw
Size, Inches	Mod. 34 C	Mod. 44 C
3 in.	\$ 20.00	
4 in.	22.00	\$24.00
5 in.	24.00	27.00
6 in.	28.00	31.00
71/2 in.	32.00	36.00
9 in.	38.00	42.00
10½ in.	44.00	49.00
12 in.	52.00	58.00
15 in.	70.00	76.00
18 in.	92.00	102.00
21 in.	120.00	135.00
24 in.	155.00	170.00

ALL STEEL INDEPENDENT CHUCK:

These salient features name-ly wide jaws, exception ally large screws with double thrust bearings and ample bearing surfaces secure the wearing quality that is most needed for this class of chuck.



Model 60

LIST PRICES. MODEL 60

Size, in.	List Price	Hole through Chuck	Diam. of Face Plate Recess
8 in.	\$42.00	21/8	434
10 in.	50.00	23/4	6
12 in.	58.00	31/2	7+
14 in.	67.00	31/2	77
15 in.	71.00	4	713
16 in.	76.00	4	713
18 in.	87.00	41/2	10
20 in.	100.00	41/2	10
21 in.	107.00	5	10
22 in.	114.00	5	10
24 in.	130.00	5	. 12
26 in.	150.00	61/2	12
30 in.	200.00	7	15
36 in.	345.00	71/2	18

HORTON-MOR-ROW HAND HAND OPERATED DRILL CHUCKS:

LIST PRICES FOR STRAIGHT SHANK

Chuck	Capacity	Price
No.	0" to 14"	\$7.00
2	0" to 3%"	7.50
3	0" to 12"	9.00
5	14" to 34"	$\frac{18.00}{25.00}$





Model 56, Iron Body—Model 58, All Steel. Six sizes each— 4 to 14 inches.

Models 56 and 58

LIST PRICES Rated Set of 4 Set of 4 Mod. 58 Size, Inches 4 in. 6 in. \$40.00 52.00 64.00 80.00 112.00 \$72.00 92.00 8 in. 10 in. 120.00 160.00 12 in.



MANUFACTURERS EQUIPMENT CO.

WALLER AVE. & FILLMORE ST. CHICAGO, ILL.

Manufacturers of Air Operated Chucks, Expanding Mandrels, Collapsible Taps and other Labor Saving Devices for Brass and Iron Goods

NEW YORK OFFICE

GRAND CENTRAL PALACE AGENTS:

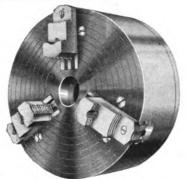
NEW YORK CITY

R. A. Braunberger West Fisher Buiwitt Co. Wm. K. Stamets Wm. K. Stamets

Machinery Hall Vernor Bldg. Jenkins Arcade Bldg. Hickox Bldg.

Chicago, Ill. Detroit, Mich. Pittsburgh, Pa. Cleveland, Ohio

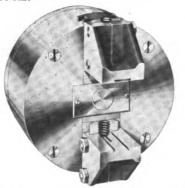
"M. E. C." THI OPERATED CHUCK: THREE JAW AIR



Furnished in two types; Universal Type, with Master Jaws adjustable, and Manufacturing Type, with Master Jaws not adjustable.

BUSHING HOLDER, for pilot bar bushings, also acts as "TIE PLATE" which

binds front of chuck together.
"M. E. C." THREE JAW AIR OPERATED CHUCKS are furnished in the following sizes: 6", 8", 10", 12", 15" and 18".
"M. E. C." TWO JAW AIR OPERATED CHUCK:



Furnished in one type only with adjustable Master Jaws. Are intended for work usually chucked with screw operated box chucks.

All "M. E. C." Air Operated Chucks

open and close instantly, that is, with very little loss of time.

"M. E. C." Two Jaw Air Operated CHUCKS are furnished in sizes from 6" to 12" inclusive.

"M. E. C." STYLE "F" AIR CYLINDER:



"M. E. C." STYLE "F" AIR CYLINDER is equipped with piston having "COMPOSITION AIR BRAKE CUP PACKINGS." Cup packings are supported by means of suitable flat and round spring rings. This construction renders piston self-adjustable and practically leak-proof.

All working parts of "M. E. C." Air Cylinders are gound.

"M. E. C." AIR CYLINDERS are furnished from 31/2" to 16" bore.

We also furnish the "M. E. C." MASTER HINGE COLLET intended for chucking castings and forgings, also for second operation chucking parts made from bar

AIR OPERATED MANDRELS, either plain or compensating, furnished for any class of work.

Our new plant is equipped with modern machinery, fixtures, tools and gauges, which enable us to guarantee first-class workmanship and interchangeability of

Write regarding your problems OURADVISIN MECHANICAL or requirements.

Literature sent upon request.



LOGAN AIR-OPERATED CHUCKS:

> To lessen the cost of production and at the same time increase your output use Logan air-operated chucks. They are practical and reliable.

Construction:

3 Jaw

Combination Chuck

The body is machined from a single casting, well proportioned and extra strong. There are no bolts, screws or joints to give trouble. Their strength and simplicity permit heavier cuts and coarser feeds.

One of the strong points is the improved Jaw Operating Mechanism. The levers are Chrome Nickel Steel, specially heat treated, the blocks and ways hardened and ground, thus minimizing wear and friction.

These chucks are dust proof in all positions of the chuck jaws. Provision is made in draw tube for the support of boring bars and clearance of boring bar pilot.

FRANK G. PAYSON COMPANY

9 South Clinton St., CHICAGO, ILL.

GENERAL SALES AGENTS FOR

THE LOGANSPORT MACHINE CO.

LOGANSPORT, INDIANA

Manufacturers of Air-Operated Chucks, Collet Chucks, Expanding Mandrels, Milling Fixtures, Milling Vises, Drilling and Tapping Fixtures, Air Cylinders and Air Valves

These chucks are made in four types:

Combination 3-Jaw

Universal 3-Jaw

Combination 2-Jaw

Universal 2-Jaw

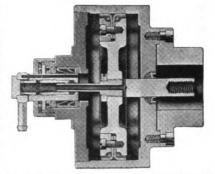
All types can be furnished with semi steel or steel bodies.

Sizes 7 to 24 inches.

LOGAN AIR OPERATED COMPEN-SATING COLLET CHUCKS:

Built on the same well-founded principles and with the same care in workmanship and materials. Made in 2 and 3 591 jaw types from 11/2" to 6" capacity.

LOGAN DOUBLE-ACTING AIR CYLINDER:



Sectional View "LOGAN" Double Acting Air Cylinder

Logan air cylinders are of highly improved design, guaranteed against leaking. They can be run at a constant speed of 1800 R. P. M. without overheating, and require very little attention.

THE PRATT CHUCK CO.

FRANKFORT, N. Y.

Manufacturers for over 25 years of Lathe and Drill Chucks

FACTORIES

FRANKFORT, N. Y.

ONEIDA, N. Y. (Formerly Oneida National Chuck Co.)

BRANCH OFFICES

NEW YORK 1123 BROADWAY CHICAGO 557 W. Monroe St.

The scoring of valuable drills, breaking of chuck jaws and screws, lost motion of the drills and the general lack of efficiency resulting from the use of old style friction chucks, render them out of place in most modern drilling operations. A chuck employing an immovable slot to receive the drill tang, does not fill the bill, because the slightest inaccuracy in the tang prevents the drill from running true.

THE PRATT-ONEIDA POSITIVE DRIVE CHUCK (patented) employs a steel driver—roughly rectangular in shape—fitted into a similarly shaped aperture in the chuck body above the

jaws. The drill tang is slipped into the slot in the driver. The driver does all the driving. Its drive is absolutely positive. The driver is allowed a slight lateral movement allowing the jaws to center the drill with absolute accuracy — e v en though the tang be out of true.

The result—No broken chuck jaws or screws—No scored drills—No lost motion through slippage.



Price List—Positive Drive

No.	Cap., in.	Price
0	0- 3/8	\$8.50
1	0- 1/2	9.00
2	0- 34	10.00
3	0-1	12.00
4	0-11/2	22.00
5	0-2	26.00

EMPIRE FRICTION CHUCKS:

PRICE	LIST

No.	Cap., in.	Price
6	0- 1/4	\$6.00
61/2	0- 3/8	6.50
7	0- 1/2	7.00
8	0- 34	8.00
9	0-1	10.00
10	0-11/2	20.00
11	0-2	25.00

THE PRATT-ONEIDA TRIPLE GRIP CHUCK furnishes three distinct grips on a drill or tap and is extremely valuable for work on hollow spindle machines where a positive drive chuck cannot be used. It

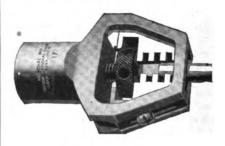
is not necessary to use all three grips unless the work be of a nature to require them.



PRICE LIST-TRIPLE GRIP

No.	Drill Capacity	Price
20	0- 1/2	\$9.00
21	0- 34	10.00
22	0-1	11.00
221/2	0-1	12.00
23	0-11/2	22.00
24	0-2	26.00

THE PRATT-ONEIDA SKELETON CHUCK is the lightest chuck, size for size, on the market. It is easily cleaned, casts no shadow and is exceedingly simple in construction. Projecting jaws permit the use of short or broken drills.



PRICE LIST-SKELETON

No.	Holding Drills	Price
1	0- 1/4	\$8.00
2	0- 3/8	9.00
3	0- 1/2	10.00
4	0- 34	11.00
5	0-1	13.00
6	0-11/2	22.00
7	0-2	26.00

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QUICK ACTION CHUCK CORPORATION

GRAND RAPIDS, MICH.

Manufacturers of Quick Action Chucks and Collets

The QUICK ACTION CHUCK with its perfect mechanical design and construction affords the operator the opportunity of interchanging rotative tools while the spindle of the machine continues to revolve, thus saving time and increasing production.

All that is necessary for the operator to do when he wishes to change the tool is simply raise the collar a short distance and the collet readily ejects itself from the chuck housing and another collet can be inserted into its place, and by lowering the collar the collet is positively locked in its place ready for operation, which consumes only a few seconds.

The design and mechanical construction that is embodied in this chuck eliminates all back lash and longitudinal play, which gives the driven tool a positive driving ground.

torque, thus no breakage of drills, taps, reamers or other tools is encountered.

There are no small, delicate parts embodied in the construction of chuck, as each and every piece has unlimited strength and durability. All parts are hardened and ground.



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SPECIFICATIONS OF QUICK ACTION CHUCKS AND COLLETS

Morse Taper Shank Drive Chuck				
No. of chuck denotes largest taper that collets drive	No. 2 Chuck	No. 3 Chuck	No. 4 Chuck	No. 5 Chuck
Morse taper shank of different size chucks Largest diameter of chuck Weight of complete chuck Price each of chucks Code word	(Prices	3 or 4 3 ¼ 6 lbs. submitted Mine	4 or 5 3½ 9 lbs. upon appl Morse	5 or 6 5 ts 20 lbs. ication) Mist

Quick Action Ty	pe-A Collets for	or Morse Taper	Shank Tools	
	Type A Collet	Type A Collet	Type A Collet	Type A Collet
No. of collet	1 or 2 Morse	114	2-3-4-Morse	No. 5 2-3-4-5-Morse 236
Price each		tted upon applic Nit	ation) Note	Neat

Quick A	ction Type-I	Collets in Bla	nk Form	
	Type B Collet	Type B Collet	Type B Collet	Type B Collet
No. of collet denotes the size chuck				
it fits	No. 2	No. 3	No. 4	No. 5
Largest diameter of collet	1 1/8	21/8	25/8	33/8
Length of collet body	15%	21/4	25/8 25/8	3 % 3 %
Price each	(Prices sub	mitted upon ap		
Code word	Steap	Sting	Stump	Stream

Code word	Steap	Sting	Stump	Stream
Quick Action Type-B	Collet in	Finish Form for	Square Shank	Drive
	Type B Collet	Type B Collet	Type B Collet	Type B Collet
No. of collet denotes the size chuck it fits	No. 2	No. 3	No 4	No. 5
Largest diameter of collet Length of collet body	15/8	21/8 21/8	2 5 8 2 5 8	3 3 % 3 3 %
Price each		ubmitted upon ap Stop	Stung	Stiff

STANDARD SHOP EQUIPMENT CO.

23rd St. and Hunting Park Ave.

PHILADELPHIA, PENNA., U. S. A.

Manufacturers of Set-up Appliances for Machine Tools

Will not break out machine table



Cannot turn in machine table

Pat. Oct. 22, 1918

The CAD bolt is a standard machine table bolt ready-for-use

CAD BOLTS WILL FIT YOUR MACHINES. WILL POSITIVELY FIT "T" SLOTS IN MACHINE TABLES WITHOUT MACHINING.

Notice the double offset upon the head—altogether unlike the present bolt. One part seats within the undercut groove of the machine table, the other part fits the slot. There is no such thing as the bolt turning when the CAD Bolt is used, and broken sections of machine bed or table are overcome; and remember INTER-CHANGEABLE and READY FOR USE.

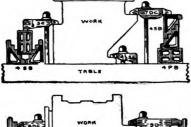
Price per Hundred Bolts without Nuts

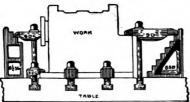
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		DIAMETER	
Length	1/2	%	*
under bend	HEAD 14 mg z 14	HEAD 1 1/16 eq. z 5/16	HEAD 1 3/16 eq. x 3/4
21/2	\$12.00	\$18.00	\$26.00
3"	13.00	19.00	28.00
31/2	14.00	20.00	30.00
4"	15.00	72.00	32.00
41/2	16.00	23.00	33.00
5"	16.50	24.00	35.00
51/2	17.00	25.00	37.00
4.	18.00	26.00	38.00
7	20.00	28,00	42.00
	21.00	30.00	45.00
9	22.50	33.00	48.00
10	24.00	35.00	52.00
12.	27.00	40.00	58.00

CAD Bolts are made in 3/8" to 1" sizes in lengths up to 30".

PRACTICABLE APPLICATIONS
OF
CAD CLAMPS, BOLTS, ETC.







A Standard Tool Room and Machine Shop Clamp

Cat. No.	L'gth	Price
3DC	3"	.30
4DC	4"	.40
6DC	6"	. 50
7DC	7"	. 75
9DC	9"	1.00
12DC	12"	2.50

CAD DOUBLE END



The Handiest Clamp Ever Used in a Shop

Cat. No.	L'gth	Price
2SC	2"	.25
3SC	3"	.30
31/2SC	31/2"	.40
41/2SC	41/2"	. 50
51/2SC	1 51/2"	1.00

CAD SINGLE END



A Universal Packing Block for Tool Room, and Machine Shop

Cat. No.	Size	Price
3PB	3x2	.25
4PB	4x21/2	.40
6PB	6x31/2	.75

CAD PACKING BLOCK



Cad Step Block

Cat. No.	Size	Price
4SB	4x3	. 50
6SB	6x4	1.00
8SB	8x6	2.00
9SB	9x3	2.00
12SB	12x4	4.00
18SB	18x4	6.00
24SB	24x4	8.00

1

CAD NUTS FINISHED CASE HARDENED EXTRA THICK

EXIKA IIICK					
Cat. No.	Size	Price			
3UN	3/8-16	.08			
4UN	1/2-13	.10			
5UN	5/8-11	.16			
6UN	34-10	.22			
7UN	7/8-9	. 27			



Write for Catalogue A3.

It is full of valuable information.

J. H. WILLIAMS & CO.

70 RICHARDS ST., BROOKLYN, N. Y.

70 Vulcan St., BUFFALO, N. Y.

Western Office and Warehouse, 70 So. Clinton St., CHICAGO

Manufacturers of Drop-Forgings

WILLIAMS' SUPERIOR DROP-FORG-INGS AND DROP-FORGED TOOLS:



Stock Forgings

STANDARD STOCK LINES:

of "Vulcan" and on and "Agrippa" and "Falcon" Brands of Tools and Forgings, including

Drop-Forged Wrenches:

in about 1000 Sizes in 40 Patterns with openings 18" to 75%".

Tool Holders:

for the economical use of High Speed Steel in Turning, Planing, Boring, Threading, Knurling, Cutting-off, Side Work, etc.

Lathe Dogs:

the "Safety" kind—Capacities ¾ to 6 inches
Bent and Straight Tail—One or Two Screws.

"C" Clamps:

Four Patterns—for Heavy, Medium, Light Service and Tool Makers.

Strap Clamps:

6 patterns, 3 to 4 sizes each, to replace old, clumsy hand-made affairs for clamping work on Planer, Lathe, Drill-Press, etc.

Chain Pipe Wrenches and Vises:

"Vulcan" with "proof-tested" Flat Link or Cable Chain,

Eye Bolts:

Plain and Shoulder Patterns—¼ to 2½" diameter Shanks—Blank or Threaded. Heat-treated and "proof-tested."

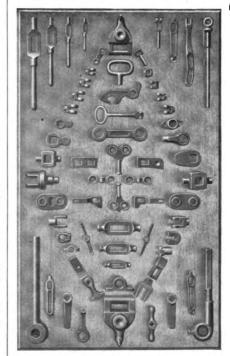
Hoist Hooks:

Shank and Eye Patterns, heat-treated and "proof-tested," for ½ to 25 tons Safe Working Load.

SPECIAL FORGINGS:

Small or large, to order for "Quality" work—Airplane and Automobile Crankshafts, Connecting Rods, etc., from straight carbon and alloy steels. Our Forge Equipment includes machines with falling weights running from 300 lbs. Board to 12,000 lbs. Steam Drop-hammers

Ask for Pocket Catalog.



Special Forgings to Order

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595

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THE WALLACE BARNES COMPANY

MAIN OFFICE AND WORKS BRISTOL, CONN.

WESTERN SALES DIVISION: Book Bldg., DETROIT, MICH.

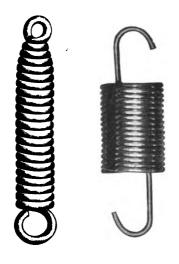
Flat and Wire Springs of Every Type

Special Screw Machine Products

Cold Rolled Spring Steel

SPRING PERFECTION FOR YOUR PROTECTION:

"Barnes-Made" Springs are made-toorder springs. Always in exact conformity with customers' specifications.



Their workmanship, vigorous vitality and fine accuracy are the logical outgrowth of over 63 years' concentrated application to spring problems,





In designing springs—from the sturdiest machinery spring to the most sensitive spring for delicate instruments or mechanisms—the experience and counsel of our trained engineers will be invaluable to you.

Just Specify-We'll Supply.



CORBIN SCREW CORPORATION

American Hardware Corporation, Successor

NEW BRITAIN, CONN.

BRANCHES

NEW YORK

CHICAGO, ILL.

DAYTON, OHIO

PHILADELPHIA, PA.



CORBIN AUTOMATIC SCREW MA-CHINE PRODUCTS:







When we estimate on your individual specifications, you can be certain of the highest quality materials and workmanship. The Corbin reputation stands squarely back of all Corbin Automatic Screw Machine Products.

They are made for greater service and satisfaction. Unusually perfected facilities assure their prompt production.





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Immediate quotations on receipt of Specifications, Blueprints, or Samples.

TOCK SCREW MACHINE PRODUCTS CORPORATION

199-203 Eighth Street, LONG ISLAND CITY, N. Y. Manufacturers of Screw Machine Products

ACCURATE PARTS:

Typewriter, speedometer, cash register, adding machine, numbering machine, phonograph and all special parts milled from the bar made to samples or blue prints.

STANDARD MILLED PRODUCTS:

Cap and set screws,

Nuts-bolts.

Machine screws.

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EQUIPMENT:

Batteries of Acmes, Brown & Sharpes Gridleys and Cleveland automatics.

Hand Screw machines and secondary operation machines in abundance.

CAPACITY:

From $\frac{1}{4}$ to $2\frac{1}{2}$.

MATERIALS:

Parts manufactured from:

Steel.

Brass,

Copper,

Bronze,

Aluminum,

German Silver.

Parts that we have Manufactured:



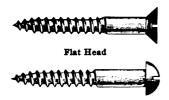
AMERICAN SCREW COMPANY

PROVIDENCE, RHODE ISLAND

Makers of Wood Screws, Machine Screws, Stove Bolts, and Tire Bolts

WOOD SCREWS:

Flat, Round, and Oval Head Wood Screws are made in Iron and Brass, from ½" to 6" in length, and from No. 0 to No. 30 (screw gauge)



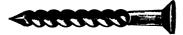


Oval Head

in diameter. The length measurement includes the whole of the head of flat heads, the countersink of oval heads, and about half the head of round heads.

DRIVE SCREWS:

Drive Screws are used by being driven in with a hammer, like nails, but they have greater holding power and can be withdrawn with an



ordinary screw driver. They are made in Iron, flat head only, from ½" to 3½" in length, and from No. 4 to No. 20 (screw gauge) in diameter.

SCREW GAUGE IN DECIMALS OF AN INCH

No. In.	No. In.	No In.	No. In.	No. In.
0 .058	5 .124	10 .189	15 .255	22 .347
1 .071	6 .137	11 .203	16 .268	24 .374
2 .084	7 .150	12 .216	17 .282	26 .400
3 .097	8 .163	13 .229	18 . 295	28 .426
4 .111	9 .176	14 .242	20 .321	30 .453

TIRE BOLTS:



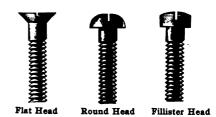
Fluted

Tire Bolts are made in Iron from 1/4" to 1/4" in diameter, from 1" to 6" in length, and in two brands. "Bay State" bolts are furnished either plain or fluted, and following trade custom are somewhat smaller in diameter than "Eagle Phila-

delphia" bolts of the same nominal diameter.
"Eagle Philadelphia" bolts are furnished plain
only. The length measurement includes the head.

MACHINE SCREWS:

Flat, Round, and Fillister Head Machine Screws are made in Iron and Brass. from ½" to 4" in length, and from No. 2 to No. 34 (screw gauge) in diameter. The length measurement



includes the whole of the head of flat heads, and excludes the whole of the head of round and fillister heads

STOVE BOLTS:

Though known in the trade as Stove Bolts, these bolts, made from bright iron wire, are in general use for all purposes requiring small plain bolts.

Flat Head



Round Head

Flat and Round Head are made from 1/2" to 1/2" in diameter, and from 1/4" to 6/2" in length. The length measurement includes the head of flat heads, and excludes the head of round heads.

STOVE RODS:

Stove Rods are the same as Stove Bolts in every respect excepting length. They are made in Iron of h'' and h'' diameter, and from 7'' to 40'' in length. The length measurement includes the head of flat heads, and excludes the head of round heads.



This company is the longest established (1838) and the largest maker of the articles here shown, and it carries a large stock, ready for immediate delivery, comprising, in addition to the varieties commonly in demand, a large assortment of varieties less frequently difficult to obtain elsewhere.

called for and often difficult to obtain elsewhere.

Price Lists, showing the exact range of sizes
as well as the prices, will be sent on application,

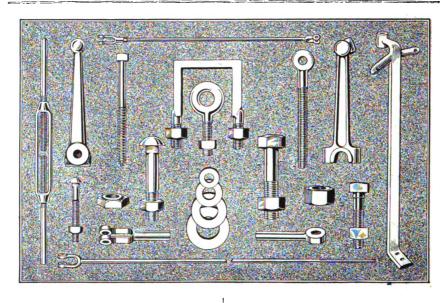
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-00

THE COLUMBUS BOLT WORKS CO.

COLUMBUS, OHIO

Bolts, Nuts, Rivets and Special Forgings



600

Over 40 years' experience in manufacturing these lines insures best quality.

Bind Quality with Quality

Our Bolts, Nuts, Carriage Hardware and Automobile Forgings are upholding the reputation of many products.

Blank Bolts
Common Carriage Bolts
Eagle Carriage Bolts
Fancy Head Carriage Bolts
Cultivator Bolts
Drift Bolts
Eye Bolts
Fender Bolts
Hook Bolts
Machine Bolts
Nutted Staples
Plow Bolts
Spring Bolts
Step Bolts

Tire Bolts

Coach Screws Lag Screws Nuts: Hexagon, square and special-Hot pressed, Forged, Cold punched, chamfered, trimmed and reamed-Thumb Washers: Round, Wrought Iron Yoke Ends Rod Ends for Yokes Yoke and Rod End Assemblies Turn-Buckles Cold drawn Rods Carriage Forgings Axle Clips King Bolts Shaft Couplings Drop Forgings to blueprint

Write for Catalog E.
Send blueprints with quantity wanted for prices on Special Forgings.

DRAKE LOCK-NUT CO.

EAST 75TH AND STANTON AVE., CLEVELAND, OHIO

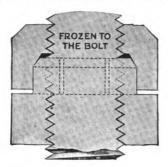
PACIFIC COAST PLANT SAN FRANCISCO, CAL.

Manufacturers of Drake Lock-Nuts



The flexible finger members of the lower or nut member are compressed inward toward center of bolt with tremendous force by screwing down the upper or locking member, thus freezing the nut to the bolt, which, when released, will move the same as any ordinary nut and do absolutely no harm to either thread.

Bolt and nut can be used over and over again without any harm to the threads.



No washer is needed.

To apply. The prime member pulls up the work to exact adjustment required; a micrometer adjustment is obtained; then apply locking member with firm turn up.



Members do not meet on horizontal line. Contact is only on annular bevels; thus the load is not lifted off prime member.

Write for samples.

Only standard hexagons throughout. Any regular wrench can be used.

The movement of the slotted members is centering radial only and not circumferential, when being locked, which would wear the threads.

Note the abundance of threads in the lower or nut member, which gives a tremendous load-carrying capacity and strength to pull up the work.

Time Saved in Application Pays Entire Cost.

PRICE LIST IN ORIGINAL BOXES

Bolt Size	STANDARD HEXAGONS	U. S. F. Threads Per Inch	Total Height of Nut	Ship'g W't in Lbs. per 100 Nuts	Boxed	Hex. Steel. Spec. Screw Stock Per 100
1/4	S. A. E.	28	3/8 15 82 29 64	2	100	4.00
/4	U. S. S.	20	$\frac{15}{32}$	4	100	4.50
<u>5</u>	S. A. E.	24	8 4	21/2	100	4.50
16	U. S. S.	18	7 6	5	100	5.00
3/8	S. A. E.	24	9 16 1/2 5/8 3 9 6 4	3	100	5.00
/8	U. S. S.	16	5/8	61/2	100	6.50
7 16	A.L.A.M.	20_	89	_5	100	6.50
16	U. S. S.	14	4 5 6 4 5 1 6 4 2 5 8 2 2 9 8 2	9	100	7.50
1/2	S. A. E.	20	64	_ 7	100	8.00
/2	U. S. S.	13	51	13	100	9.00
9	S. A. E.	18	$\frac{25}{82}$	101/2	100	10.00
16	U. S. S.	12	3 2	17	100	11.00
5/8	S. A. E.	18	7/8	16	50	12.00
/8	U. S. S.	11	132	24	50	13.00
3/4	A.L.A.M.	16	116	21	50	16.00
/4	U. S. S.	10	132	37	50	17.00
7/8	S. A. E.	14	1 8 2 1 7 8 2 1 8 2	30	50	21.00
/8	U. S. S.	9	$1\frac{1}{3}\frac{1}{2}$	52	50	24.00
1"	S. A. E.	14	1%	45	50	32.00
1	U. S. S.	8	1 1 7	70	50	35.00
11/8	U. S. S.	7	13/4	97	50	48.00
11/4	U. S. S.	7	1 2 9	127	50	66.00
13/8	U. S. S.	6	2 1 2	175	20	98.00
11/2	U. S. S.	6	218	215	20	138.00
15/8	U. S. S.	51/2	23/8	275	20	186.00
13/4	U. S. S.	5		325	20	260.00
2"	U. S. S.	41/2	$\frac{2\frac{1}{3}\frac{5}{2}}{2\frac{2}{3}\frac{3}{2}}$	450	20	430.00

 $3^{\,\text{I\hspace{-.07cm}I}}$ U. S. S. to order. DISCOUNTS ON APPLICATION. PRICES SUBJECT TO CHANGE WITHOUT NOTICE

601

THE FALLS RIVET COMPANY

KENT, OHIO

Established 1881 DISTRICT OFFICES

Ford Bldg. DETROIT, MICH. Otis Bldg. CHICAGO, ILL. Harrison Bldg. PHILADELPHIA, PA. 395 E. 146th St. CLEVELAND, O.

Manufacturer of all Types and Varieties of Rivets, Bolts, Nuts, Etc.

The Falls Rivet Company offers service in your fabrication problems through its splendid facilities, skilled workmen and long experience in specializing in the production of rivets, bolts and nuts.

We list, under general headings, our products. In each class we make many types and sizes.

RIVETS:

Small Large Belt Boiler Tinners' Coopers' Brake Band

Ship

Loop Machine

Plow

Sink

Step

Stove

Stud

Specials

Special

BURRS:

Up to 3/4" O. D.

Wheel

602 BOLTS:

Automobile Blank Carriage Coach, G. P. Elevator Ends Fancy Heads

Fancy Heads Fin Heads Hanger Lag

Tire Threaded Wire

SCREWS:

Steel Machine

Brass Machine



NUTS:

Cold Punched, champered and trimmed with reamed holes

Cold Punched Plain Hot Pressed Semi-Finished Finished—casehardened Fancy Stove Steel Wing Carriage Machine Stove

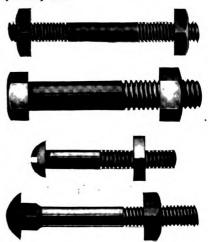
FINISHING, COATING AND TREAT-ING:

Our Metallic Tinning cannot be excelled for carefulness of application and purity of material and process. We are also equipped to tin-plate, copper-plate and brass-plate.

Electro-Galvanizing can be furnished and the process as applied by us assures the maximum in appearance and resistance to oxidizing.

Our heat-treating and case-hardening departments are operated under the supervision of experts which assures you receiving the good work conforming to your specifications.

Our new catalog No. 19 will be of great value and interest to users of rivets, bolts and nuts and will be gladly sent upon request.



THE MILTON MANUFACTURING CO.

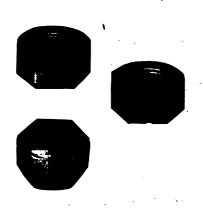
MILTON, PENNA.

Manufacturers of Cold Punched and Hot Pressed Nuts, Wrought Washers, Refined Bar Iron

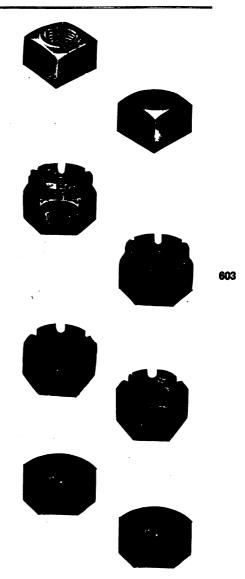
"MILTON" NUTS:

Cold Punched Chamfered Square or Hexagon—Plain Square or Hexagon—Hot Pressed Square or Hexagon (Blank with drilled holes or tapped to Pratt & Whitney Standard)—Semi-finished—Finished, Finished Case Hardened, Slotted and Castle.

From the purchase of the raw materials until the finished product is ready for shipment, the manufacture of "Milton" Nuts is under the constant supervision of men who know, theoretically as well as practically, thus assuring the purchaser of receiving an absolutely uniform Nut, rendering a superlative degree of Efficiency at all times.



Many builders of the most intricate machinery are specifying "Milton" Nuts exclusively, owing to their accuracy, which admits of rigid construction and prevents vibration, at the same time adding mechanical refinement to their machines.



We have faith that, knowing our materials and their uses by technical and practical knowledge, we can meet in our line the highest scientific requirements.

REED & PRINCE MFG. CO.

WORCESTER, MASS.

Manufacturers of Screws, Rivets, Bolts and Nuts for Every Purpose





give satisfaction

604

WOOD SCREWS

MACHINE SCREWS CAP SCREWS

SET SCREWS STOVE BOLTS

RIVETS BURRS BOLTS NUTS

SPECIAL HEADINGS AND FINISHES

We are equipped to manufacture special products in connection with our regular line and solicit your specifications.

Let us figure with you on your specials; screws, bolts, rods, nuts, rivets, burrs, pins, studs, threaded wires, small stampings.

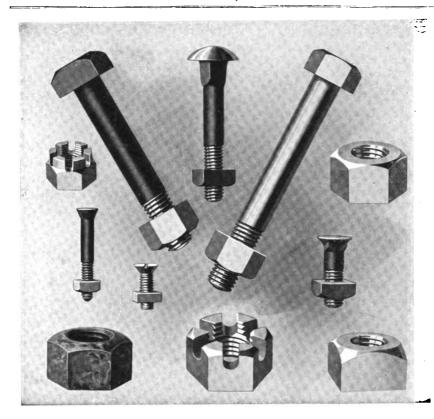
When special finishes are desired our modern plating department can handle your requirements to your satisfaction.

We specialize on furnishing nickel, brass, copper, bronze, silver, and oxidized finishes. Can furnish material tinned and galvanized by hot process or electroplated.

RUSSELL, BURDSALL AND WARD BOLT AND NUT COMPANY

PORT CHESTER, N. Y., PEMBERWICK, CONN., ROCK FALLS, ILL.

Makers of EMPIRE Bolts, Nuts and Rivets



605

A HISTORY OF PIONEERING:

When you look at the history of the bolt and nut industry, with the revolutionary improvements in methods of manufacture that the last few decades have witnessed, you see the history of Russell, Burdsall & Ward.

For this house was the first to make cold punched steel nuts. It was the first to make cold headed bolts. It was the first to standardize and market its products under a trade-marked name—EMPIRE—for the protection of its customers; a name that means an unreserved guarantee of quality, from an institution of international repute.

WHERE EMPIRE PRODUCTS ARE MADE:

Out of this long career of pioneering has grown an organization occupying three huge plants, devoted exclusively to

the production of bolts, nuts, rivets and washers. Among the mechanical facilities of these plants are ingenious automatic nut machines that have no duplicate anywhere in the industry. These machines cold punch, champfer, trim and burnish in one operation, where in another plant five separate machines would be required. Not only does this method make for speedier production, but for a sounder and more uniform quality of product.

THOROUGH INSPECTION:

A staff of trained inspectors, under the expert guidance of a famous tool maker, keep a close watch over the work of each department. No goods not flawlessly perfect can pass muster—

For there is a reputation of 75 years' honorable dealing bound up in the quality of Empire Bolts, Nuts and Rivets.

SAMUEL J. SHIMER & SONS

Established 1868

MILTON, PA.

Manufacturers of Machine Parts Made of Iron, Steel or Brass

The making of standard Set and Cap Screws of iron forms a liberal part of our production. Screws and turned parts of special design, wanted in quantity, are quoted upon receipt of samples and specifications. We make all threads to adopted standards, preserving sizes carefully, and guarantee our work equal to the best.

CAP AND SET SCREWS:

From stock or made promptly to order in lots of 100 or more.

Iron Set Screws:

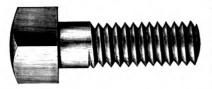
606



They are finished with black or ground heads, oval or cup point. Diameters of screw range from 1/4 to 11/4 inches and length under Head to Extreme Point from 1/2 to 5 inches. All other shapes are made per order and quoted "special," prices being based on quantity.

All Set Screws are case-hardened and heads are ground before hardening.

Square Head Cap Screws:



We use a splendid refined bar iron for all Cap Screws kept in stock of every size to meet the requirements of the user.

Hexagon Head Cap Screws:



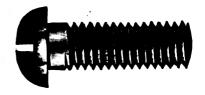
We make all Hexagon Head Cap Screws per order, keeping in stock for immediate use, Cold Drawn Steel for any size listed. With U. S. or V threads to specifications.

Round and Fillister Head Cap Screws:

Diameters of screw range from 1/8 to 1 inch and length under Head to Extreme Point from 3/4 to 6 inches.

Flat and Button Head Cap Screws: Milled from Solid Bar.





Send for Catalogue No. 33 giving Standard List Prices.

DIAMOND EXPANSION BOLT CO.

90 WEST ST., COR. CEDAR, NEW YORK

FACTORY: GARWOOD, N. J.

Manufacturers of "Diamond Specialties:" Expansion Bolts and Anchors, Drills, Cable and Pipe Clamps, Conduit Rods, Etc.

DIAMOND N-Y EXPANSION BOLTS:



"Diamond N-Y" Expansion Shields-Patented



"Diamond N-Y" Screw Anchors-Patented

"DIAMOND N-Y" Two PART SHIELDS AND SCREW ANCHORS are used with standard lag screws and wood screws. For attaching light and heavy equipment to brick, stone or concrete walls.

DIAMOND "RAPID FIRE" DRILL:



"Rapid Fire" Drill

Reduces cost of drill-ing hole in brick, stone ing hole in brick, stone and concrete. Strikes eight sharp blows with each with each turn of the crank. Points are inter-changeable for all sizes of holes.



DIAMOND REVERSIBLE TOGGLE BOLTS:



EMPIRE CONDUIT RODS:

Patented No. 911.854, Feb. 9, 1909.



With or without Wheels

Made of best quality Hickory with quick-acting Automatic Couplings.

"LONG-SAUT" CABLE AND PIPE CLAMPS:

Used for attaching lead cable and parallel runs of bridle wire in interior block distribution.

This form of telephone construction is now being employed in all modern telephone plants.

"Long-Saut" Clamps are made to conform to



"Long-Saut" Clamps

every diameter of cable and may be used with or without bridle rings, as conditions require. Attached with Diamond Screw Anchors to brick, stone or concrete or with wood screws to wooden structures.

DIAMOND MALLEABLE CLAMP:



Malleable Iron One Hole

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607

THE CHAMPION RIVET COMPANY

Established 1895

CLEVELAND, OHIO

WESTERN PLANT, EAST CHICAGO, IND.

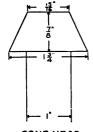
Manufacturers of Boiler, Ship, Structural and Tank Rivets

VICTOR STEEL RIVETS:

Rivets, though seemingly unimportant, are the most important units entering into the construction of any steel structure.

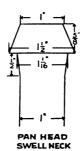
Upon their quality and the method of driving them, life and property depend.

Mechanical Engineers and Marine Architects specify them freely.



608

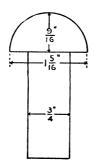
CONE HEAD STRAIGHT NECK





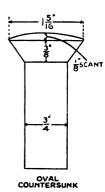
PAN HEAD SWELL NECK WHEN DRIVEN

The few specimens illustrating this page are not descriptive of our whole line. We manufacture all styles.



We manufacture all sizes of rivets—from ¼ of an inch in diameter up.

BUTTON HEAD



Our rivets conform to Standard specifications such as:

A. S. M. E. Code.

American Society for Testing Materials. American Bureau of Shipping.

U. S. Navy Specifications.

Lloyd's Register of Shipping.

Full data and record of tests furnished on application.

We publish one of the most interesting booklets on this subject. It is entitled SCIENTIFIC FACTS, and is yours for the asking. You will find it contains more information on this seemingly simple subject than has ever been written.

THE CHAMPION RIVET COMPANY

Established 1895

CLEVELAND, OHIO

WESTERN PLANT, EAST CHICAGO, IND.

Manufacturers of Boiler, Ship, Structural and Tank Rivets



The substitution of Soft Basic Open Hearth Steel for Wrought Iron in the manufacture of Rivets was begun about the year 1890. Previous to this date practically all rivets were made of puddled iron.

In the year 1895, the founders of The Champion Rivet Company foresaw the possibilities of high grade Soft Basic Open Hearth Steel as a material for the manufacture of rivets and they believed that this grade of Steel Rivet not only equalled the Iron Rivet in every respect, but that it possessed several distinct advantages over the older material. Coincident with the establishment of a small manufacturing plant for the production of Rivets, they instituted a series of exhaustive comparative tests, physical, chemical and mechanical.

Parallel tests were made on Basic Open Hearth Steel and Wrought Iron Rivets with the result that the Steel Rivet met every requirement that was demanded of the Wrought Iron Rivet.

With proper supervision a Steel Rivet is of more uniform quality than a Rivet produced from Wrought Iron. The fact that the faith of the founders of The 609 Champion Rivet Company in the Steel Rivet was well placed, is evidenced today by the enormous expansion of this industry as exemplified in the operation of The Champion Rivet Company.

The Basic Open Hearth Steel used in the production of the "VICTOR" rivet is of the very best manufacture and the product of the Company is kept at its uniform high grade by systematic and conscientious inspection of all the rivet steel purchased by the Company.

> OSCAR TEXTOR, Chemist

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IRON CITY PRODUCTS CO.

7501 THOMAS BLVD., PITTSBURGH, PA.

Exclusive Manufacturers of Rees Double Worm Gear Drive Jacks for Passenger Car, Truck, Railway and Industrial Uses



REES Double Worm Gear Drive JACKS for

Passenger Car and Truck Service Railway and Industrial Purposes

Four Working Parts—No springs, pawls or intricate mechanism to get out of order.

Safe—No back kick—automatically locked in either direction—secure at any height—cannot drop the load.

Powerful—Double worm—all forces balanced—operates with least effort.

Dependable—Impossible to drive lifting rack above normal lift—friction reduced to a minimum—cannot stick at any point.

Convenient—Easily handled—light in weight for lifting capacity. Fully guaranteed.

Rees Double Worm Gear Drive Jacks embody the patented double worm gear drive principle used for the first time in any Jack. The double worm gear drive multiplies the leverage applied, end thrust and side strain are eliminated and friction is reduced to a minimum.

It is this principle as shown, which accounts for the great lifting power of the Rees Jack. All pawls and springs have been eliminated and you have no multiplicity of small and delicate parts to get out of order.

Great power and dependability are combined with convenience, safety, speed and ease of operation in each of the Rees Double Worm Gear Drive Jacks illustrated.

They are light in weight for their lifting capacity and are easily handled and operated. A liberal factor of safety is allowed for overloading in emergency.

The General Purpose and Journal Jacks shown on this page are especially designed for general service in railway and machine shops, car yards, car inspection work and removal and replacement of journal brasses in railway equipment. They do their work full with small effort on the part of one operator. A single Rees Jack will often fulfill the needs otherwise requiring two or three jacks.

Full information and prices sent on request.

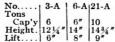
Interior View
showing the exclusive
features of the
DOUBLE WORM
GEAR DRIVE





No	1	5-A
Tons Capacity	2	21/2
Height	1014"	1034
No Tons Capacity Height Lift	51/2"	6"

Truck Model

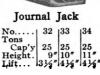




General Purpose and Car Jack

No...... | 25-A | 31-A Tons Cap'y | 10 | 15 Height | 24" | 28" Lift | 16" | 18"





UNION SPRING AND MFG. CO.

GENERAL OFFICES

1207 Fulton Bldg., PITTSBURGH, PA.

WORKS: New Kensington, Pa. **BRANCH OFFICES**

NEW YORK CHICAGO 50 Church St. Fisher Bldg. Mutual Bldg.

Todd Bldg.

Crozier Bldg.

RICHMOND, VA. LOUISVILLE, KY. PHILADELPHIA, PA. BALTIMORE, MD. Munsey Bldg.

Manufacturers of Coil and Elliptic Springs of All Kinds Pressed Steel Journal Boxes and Journal Box Lids, Steel Castings

SPECIFICATIONS FOR HALF EL-	If solid					
LIPTIC SPRINGS:	height is not known give	Hel	ical Sp	rings		
DIMENSIONS OF	number of coils or pitch. These dimen- sions are equiv- alent.	Item	Outer	Middle Coil	Inner	
FOR		<u> </u>				
QUANTITY WANTED		Outside Diam.				
OVER ALL LIGHT		Free Height				
WIDTE OF BAND		Size of Bar				
	O CARRYLBS.	Solid Height				611
NUMBER OF PLATES	ERLX	Number of Coils				
SPECIFICATIONS FOR HELICAL		Loaded Height				
SPRINGS:		Load				
FOR		Capacity Solid				
QUANTITY WANTED	KENSINGTON	JOURNA	L BC	X:		
Place a Cross (X) Opposite Kind of Spring Wanted			1			
Single Coil Spring						
Double Coil Spring						
Triple Coil Spring						
Grouped in Plates	This box is n	-				
NOTE: If grouped in plates, please state the following: Free height over plates			⅓″ x	10"	s and	
group	It is the str					

AMERICAN INCANDESCENT HEAT CO., INC.

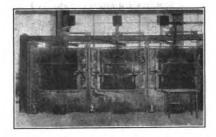
(Furnace Builders under Smallwood Patents)

10 Post Office Square, BOSTON, MASS.

SALES AGENTS: INDUSTRIAL FURNACE CORP.

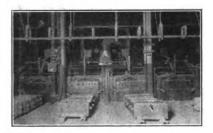
Bituminous Coal Fired Furnaces

HEAT TREATING



Three Working Chambers, One Combustion Chamber

CAST IRON ANNEALING



Four Working Chambers, Two Combustion Chambers

CARBURIZING AND HEAT TREAT-512 ING



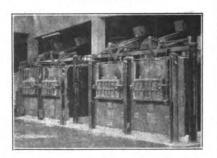
Six Working Chambers, One Combustion Chamber

COPPER AND BRASS ANNEALING



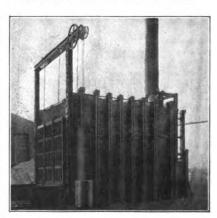
Two Working Chambers, Two Combustion Chambers

CARBURIZING



Four Working Chambers, One Combustion Chamber

STEEL CASTING ANNEALING



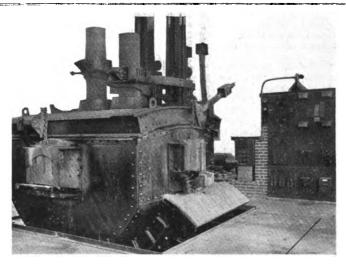
One Working Chamber, One Combustion Chamber

ELECTRIC FURNACE CONSTRUCTION COMPANY

908 CHESTNUT ST., PHILADELPHIA, PA.

FOREIGN OFFICE: T. H. WATSON & CO. LTD., KINGHOUSE, KINGSWAY, LONDON, ENG.

Electric Furnaces for Melting Steel, Smelting Ore, Ferro Alloy Corundum and Brass Melting, Heat Treating and Annealing Furnaces



Greaves-Etchells 3-Ton Furnace

"GREAVES-ETCHELLS" ELECTRIC FURNACES are specially designed for melting steel and iron. They are manufactured in sizes ranging from ½ to 30 tons capacity. Since the "GREAVES-ETCHELLS" Furnace was introduced there have been more "GREAVES-ETCHELLS" Furnaces sold than any other type.

From comparative tests made with other electrical furnaces it has been proved the most economical and efficient in operation of any type of furnace. Its distinctive features are the resistive hearth and bottom heating combined with a steady electrical load and high power factor. The charge is evenly and uniformly heated assuring perfectly homogenous steel or castings as no chilling is possible on the furnace hearth.

The method of obtaining a balanced primary from either a two-or three-phase electrical supply and the method of generating heat in the hearth of the furnace, together with many other mechanical devices, are protected by patents.

HEAT TREATING AND ANNEALING FURNACES:

613

This Company claims to be better equipped than any other to install electric heat-treating and annealing furnaces. It has patented processes and has a staff of experts for this work. A notable installation made by this Company is a furnace to treat 50,000 lbs. of steel at one charge, the temperature of the material treated being raised to 1600° F.

FERRO-ALLOY FURNACES have been made a subject of special study and the Company has perfected a furnace for this purpose which is giving satisfactory results. Among the ferro-alloy furnaces installed is one in Spain.

COOLING RINGS AND CARBON HOLDERS:

The improved design of the cooling rings and carbon holders used on the "GREAVES-ETCHELLS" Furnaces proved such a success that patents have been applied for and they are now being supplied to users of other types of furnaces. With these cooling rings installed no flames can escape around the electrode, thus preventing penciling and ensuring higher thermal efficiency.

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THE ELECTRIC FURNACE COMPANY

GENERAL OFFICES: ALLIANCE, OHIO

WORKS: SALEM, OHIO

614

NEW YORK OFFICE 15 PARK ROW

Manufacturers of Baily Electric Furnaces

THE RESISTANCE PRINCIPLE:

All Baily furnaces operate upon the resistance principle, which transfers heat by radiation and makes the most simple and rugged type of electric furnace in existence. The furnace chamber is built of special fire-brick. Resistor material of broken carbon fills a refractory trough that is made of carborundum fire-sand. Electrodes are not used as a heating medium and thus a very expensive maintenance item is avoided. Incandescent heat is radiated from the trough down upon the metal on the hearth. This heating principle is exactly similar to the incandescent electric lamp.

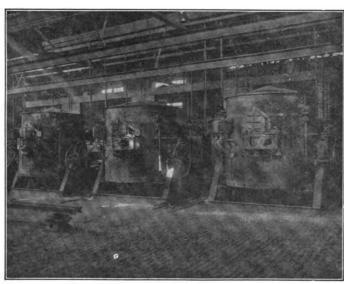
105 K. W. STANDARD TILTING TYPE furnace has a hearth capacity of 1500 pounds and a melting rate of 600 pounds per hour. The steel shell is 7' in diameter, is supported by cast steel brackets, and is tilted by a hand wheel mechanism attached to the side. This type is widely used to produce brass of the closest analysis and of minimum impurities, at a lower cost than any crucible, open flame, or reverberatory furnace, using coal, coke, oil, or gas as fuel.

105 K. W. NOSE TILTING TYPE FURNACE is especially adapted for rolling mills and is arranged to pour the

metal ! directly into the moulds. It is motor operated and has a motor operated casting table.

A larger 300 K. W. furnace of the same type has a hearth capacity of 5000 pounds, and a melting capacity of 2000 pounds per hour.

500 K. W. TAPPING TYPE, is a rectangular, nontilting furnace for melting aluminum or brass. Hearth capacity of 3 to 9 tons.



105 K. W. Brass Melting Furnaces

All sulphur gases, oxides, and other impurities are eliminated, and in this non-oxidizing atmosphere, furnace conditions may be controlled by standards of laboratory accuracy.

BAILY ELECTRIC FURNACES FOR MELTING NON-FERROUS METALS:

Built for Rolling Mills, Smelters and Foundries in Electrical Capacities: 40 K. W. to 1500 K. W. Hearth Capacities: 500 pounds to 200 tons, and melting rates of 1/2 Ton to 8 Tons per hour.

is built with 600 K. W. transformer capacity, and will melt brass at the rate of 2 tons per hour. Hearth capacity of 9 tons.

50 and 75 K. W. TILTING FURNACES exactly similar to the standard 105 K. W. furnace, except in size and hearth capacity. The 50 K. W. unit holds 500 pounds of brass and melts 350 pounds per hour. The 75 K. W. furnace has a hearth capacity of 750 pounds and a melting rate of 500 pounds per hour.

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THE ELECTRIC FURNACE COMPANY

BAILY ELECTRIC FURNACES FOR HEATING, ANNEALING, AND HEAT TREATING:

Built for Rolling Mills, Foundries, Machine Shops, and Motor Car Plants, in Electrical Capacities: 150 K. W. to 1500 K. W., and Furnace Capacities: ½ ton to 10 tons per hour.

150 K. W. Pusher Type Heat Treating Furnace,

PUSHER TYPE CONTINUOUS furnaces are built in 150 K. W., 3 6 0 K. W. and 600 K. W. and 1500 K. W. sizes. The accurate temperature control of this furnace has met the most exacting standards in heating and

aluminum. AUTOMATIC CON-TROL TYPE continuous furnaces are built in 250 K. W. and 900 K. W. sizes, for heat treating either castings or forgings in quantity. This furnace will secure uni-

annealing products of steel, copper, brass and

form annealing, tempering and quench-

CAR TYPE FURNACES are built in 150 K. W., 300 K. W., and 600 K. W. sizes. Each size has demonstrated its service in annealing steel, copper, brass or aluminum.

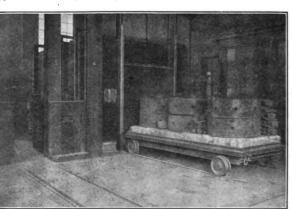
SPECIAL TYPES for PARTICULAR PROBLEMS-Baily engineers are ready to meet any metallurgical or heat treating problem, no matter how large or difficult it may be. Knowledge acquired through years of specialization in electric furnace construction, has made possible the building of many special type Baily Furnaces to meet the particular

problems of various American Industries.

ELECTRIC F U R - NACE LABORATORY— A modern laboratory at the Salem plant is completely equipped for testing alloys and solving difficult metallurgical problems.

TRANSFORMERS, of special design, wound for voltages 22,000 and under, are built by the Electric Furnace Company in its own plant for every Baily Furnace.

SELECTIVE OIL BREAK SWITCHES are a necessary part of Baily furnace equipment. By this means any one of



150 K. W. Car Type Furnace

the various low tension voltages of the transformer may be readily impressed across the terminals of the furnace.

Any metallurgical or heat treating problems may be submitted for the careful consideration of special engineers.

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INDUSTRIAL FURNACE CORPORATION

10 Post Office Sq., BOSTON, MASS.

ANNEALING AND NORMALIZING FURNACES:

Bituminous Coal Fired Gas Fired

CARBURIZING FURNACES:

Bituminous Coal Fired Gas Fired Oil Fired

HARDENING FURNACES:

Electric Gas Fired Oil Fired

DRAWING FURNACES:

Electric 616 Gas Fired

INGOT AND BILLET FURNACES:

Bituminous Coal Fired Gas Fired Oil Fired

Note.—Furnaces for this work designed for hand firing or mechanical stokers and built with or without recuperators and with or without waste heat boilers.

FORGING FURNACES:

Gas Fired Bituminous Coal Fired Oil Fired

Note.—Built with or without recuperators.

MALLEABLE IRON FURNACES:

Bituminous Coal Fired Gas Fired Electric

FERROUS AND NON-FERROUS MELTING FURNACES:

Electric Gas Fired

NON-FERROUS ANNEALING FURNACES:

Gas Fired Electric Coal Fired Oil Fired

ENAMELING FURNACES:

Electric Gas Fired

CORE OVENS:

Bituminous Coal Fired Electric

ACCESSORY FURNACE EQUIPMENT:

Cold Gas Producers Hot Gas Producers

OIL COOLING SYSTEMS:

Oil Cooling Refrigeration System
Oil Cooling Air Film System

THE INDUSTRIAL FURNACE COR-PORATION:

As an engineering organization insures the COORDINATED INSTALLATION of industrial furnace plants.

As a contracting organization it makes possible CENTRALIZED RESPONSI-BILITY for results from industrial furnace plants.

It places at your command a combined engineering knowledge for the better solution of your industrial furnace problems.



CHARLES F. KENWORTHY, INC.

WATERBURY, CONN.

Industrial Furnaces—"Non-Oxidizing A Specialty"

TWIN DOUBLE END ANNEALING FURNACE:

FOR ANNEALING BRASS, COPPER AND NICKEL SILVER PRODUCTS.

BULLETIN 81



Annealing Furnace

HEAT TREATING FURNACE:

FOR ALL STEEL ANNEALING AND HEAT TREATING OPERATIONS.

SINGLE CHAMBER, VERTICAL TYPE NON-OXIDIZING ANNEALING FURNACE:

FOR ALL NON-FERROUS METALS.

BULLETIN 87-N

SIZES TO MEET YOUR SPECIAL REQUIREMENTS.

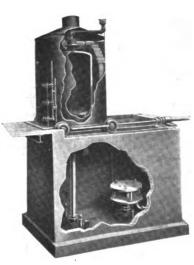
> KENWORTHY FURNACES GIVE

THE BEST OF RESULTS



Heat Treating Furnace

617



Non-Oxidizing Annealing Furnace

W. S. ROCKWELL COMPANY

50 Church St., NEW YORK

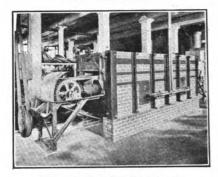
(Hudson Terminal Bldg.)

Furnace Engineers and Contractors

BRANCHES: CHICAGO-CLEVELAND-DETROIT

COMPLETE INDUSTRIAL FURNACE EQUIPMENT:

OIL-GAS-COAL



Automatic Heat-Treating Furnace Chain Conveyor Type

"FURNACE AND FUEL TO SUIT

618 THE WORK"—is the rule governing our
consideration of new or the improvement of existing furnace equipment to
suit your needs under your plant conditions.

Our practice is to deal with each case on its individual merits, recommending changes in methods, equipment or fuel only when it is apparent that these will be productive of better results.

We do not merely sell furnaces, but, rather, means for efficiently producing results in industrial heating operations, which involves a great deal more than combining brick and iron or the burning of fuel.

LET US HANDLE YOUR HEATING PROBLEMS:

We make inspection of plant, devise methods of heating and handling material, furnish complete industrial furnace equipment adapted to the individual plant conditions, and guarantee results, using coal, gas or oil, as the best interests of our patrons require.

The following list of furnaces and appliances illustrates the variety of work we do and our familiarity with furnace and fuel problems:

Angle Heating Furnaces
Annealing Furnaces
Automatic Furnaces
Billet Heating Furnaces

Blast Gates, New Air-

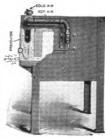
Ingut
Blowers
Carbonizing Furnaces
Cyanide Furnaces
Drying Furnaces
Enameling Furnaces
Forging Furnaces
Fuel Oil Appliances
Hardening Furnaces
Heat - Treating Furnaces

naces
Heating Furnaces
Lead Pot Furnaces
Melting Furnaces
Muffle Furnaces
Plate Heating Furnaces

Rivet Furnaces Rivet Rod Furnaces Spring Fitting Furnaces

Soft Metal Melting Furnaces Stoker Fired Recuperative Furnaces Scaling Furnaces Tempering Furnaces Upsetting Furnaces Varnish Boiling Furnaces Wire Furnaces

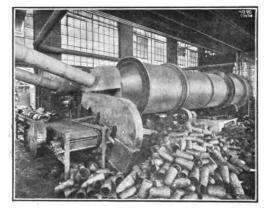
Write for Catalog



Economizer Forge, showing deflection of hot gases, with induced air toward the furnace, and the preheating of air for combustion.



SEE
OURADYTS IN
MECHANICAL
ENGINEERING
THE JOUESAL OF THE
A 5 M &



Rotary Automatic Heat-Treating Furnaces Heavy drawn steel shells are being annealed

CHICAGO FLEXIBLE SHAFT CO.

1136 SOUTH CENTRAL AVENUE, CHICAGO

350 BROADWAY, NEW YORK-RAILWAY EXCHANGE BLDG., ST. LOUIS

Manufacturers of Furnaces for Annealing, Carbonizing, Hardening High Speed and Carbon Steel, Heat Treating, Cyanide or Lead Hardening, Forging, Metal Melting. Tempering, etc.

STEWART OVEN FURNACES:

The exacting requirements of modern heat treatment are successfully met by Stewarts. Well adapted to tool and die hardening, carbonizing, annealing, tempering, etc. Combustion Well adapted to tool and die hardening, carbonizing. annealing, tempering, etc. Combustion
takes place beneath the hearth, flame surging
over it and into arch of furnace, in no case
striking work direct. Burner placement guarantees uniform heat distribution to all parts of
chamber. Temperature under instant and absolute control. High-refractory linings practically eliminate radiation, and fuel consumption
is economical. Stewarts are sturdily constructed and only dependable materials entstructed, and only dependable materials enter into their manufacture.



STEWART NO. 14 OVEN FURNACE:

Indirect Heat. with U-shaped Bot-tom Slab—for Hardening High Sp or Carbon Steel

Specifications

Opening, 6" x 10". Depth, 15". Floor space, 1" x 36".

34" Gas and air connections, 11/4 Shipping 1210 lbs. weight,

For gas or oil fuel

Equipped with hinged door, as illusstrated. Five furnaces of

this type—four rec-ommended for high speed steel.

STEWART NO. 10 OVEN FURNACE:

Indirect Heat, with Flat Bottom Slab-for Heat Treating, Annealing and Carbonizing.

Specifications Opening, 12" x 20".

Depth, 48". Floor space, 42" x 66".

Gas and air connections, 1 ½". Shipping weight, 3900 lbs.

For gas or oil

Equipped with counter-balanced door door, as illustrated.

Forty-five stock with balanced door —U-shaped or flat bottom slab. Seventeen stock sizes for oven furnaces on permanent foundation.



STEWART NO. 14H OVEN FURNACE: For High Speed Steel



Burners on left side enter under-neath bottom slab same as in a regular oven, but entrance of opposite burners is in heating space, making equip-ment under and over fed.

Specifications Opening, 6" x 10".

Depth, 15".

Floor space, 36" x 36".

Gas and air connections, 11/4".

Shipping weight, 1450 lbs. For gas fuel only.

Four other 619 stock sizes.

STEWART FURNACES FOR HIGH SPEED STEEL:

Numerous types and sizes—No. 3 with cylindrical chamber; No. 4 with balanced door; Nos. 1 and 0 (Bench) with shifting door; cylindrical furnaces in which pieces are suspended; oven furnaces (illustrated above), under the condense of the c and over fed; barium chloride; as well as the regular oven furnaces, six of which handle high speed steel. Stewarts guarantee the accuracy so essential in high speed steel hardening—minimizing spoiled material and danger of tool or part



STEWART CRUCIBLE FURNACES:

For Lead or Cyanide Hardening.

Used extensively for heat treating or car-bonizing embossing dies, engraving plates, small steel parts for type-writers, guns, etc.—in general, for a wide range of articles requiring a hard wearing surface without great depth of case. Also used for other chemical solutions, the fumes of which are poisonous or offensive to workmen.

Built with rings for suspension of pots by their flanges. Burners

are so placed that flame is thrown around sides of pot at a tangent. Work is thoroughly heat penetrated, but flame does not strike it direct, eliminating danger of burning pot.

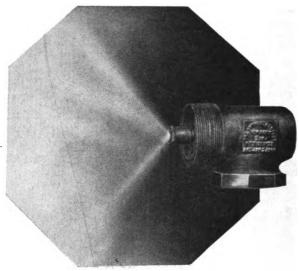
Other crucible furnaces for oil tempering, soft metal melting, brass melting, tinning, galvanizing, salt baths, etc.

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THE ANTHONY COMPANY

9 Jackson Avenue, LONG ISLAND CITY, N. Y.

Liquid Fuel Engineers



620

Don't Waste Fuel

A Perfect Mist of Oil

Consult Us

ANTHONY NEBULYTE OIL BURNERS:

Low and High Pressure Designs to Suit Every Requirement.

A Trial Proves Their Unequalled Operating Characteristics.

ANTHONY NEBULYTE OIL-GAS BURNERS:

For Use with Either of These Fuels, or Both in Combination. No High Pressure Air Required.

ANTHONY CRUCIBLE FURNACES:

Large Output, Low Operating Cost, Long Crucible Life.

Soft Flame, Small Shrinkage, Non-oxidized Metal.

ANTHONY RIVET FORGES:

Compact, Portable, Economical, the Equal of Four Coal Forges.

ANTHONY OIL AND GAS BURNING EQUIPMENT:

For Annealing, Hardening, Forging, Melting—All Purposes.

ANTHONY OIL AND GAS BURNING SYSTEMS:

For Industrial Heating Processes. For House Heating Uses.

ANTHONY NEBULYTE SPRAYS:

For Water-Gas Machines.
For Any Other Purpose.

W. N. BEST, INC.

11 BROADWAY, NEW YORK

Engineers in Caloric: Liquid Fuel Equipment; Furnaces for Heating, Melting and Heat Treatment of Metals. High Pressure, Low Pressure, Volume Air, Air Carburetting and Mechanical Burners of All Sizes

W. N. BEST CALOREX LIQUID FUEL FURNACES AND EQUIPMENT:

Thirty Years' Experience in Handling Liquid Fuel. All Installations Guaranteed.

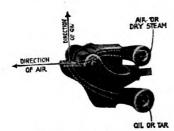
Designs for changing coal-fired furnaces to oil-fired, for the remodeling of existing oil-fired furnaces, and the con-struction of all forms of furnaces for heating and heat treatment of metals.

If your present liquid fuel equipment is not in every way satisfactory, it can be remodeled to give perfect results. We guarantee entire satisfaction.

To secure 100% economy and 100% efficiency use W. N. Best Oil and Tar Burners for Annealing, Case Hardening, Tempering, Forging, Heat Treating, etc.

W. N. Best High Pressure Burner Unmounted:

- 1. Note the direction of arrows. The air or steam meets the oil at right angles, thus thoroughly atomizing the oil externally, which prevents clogging or carbonizing, the burner always being kept clean.
- 2. By releasing the set screw in yoke and raising the lip any obstruction that might find its way through the air line can be blown out.



High Pressure Burner

3. Air or dry steam from 15 pounds up can be

3. Air or dry steam from 15 pounds up can be used to atomize the oil.
4. The burner being in form of a syphon requires but very low oil pressure.
5. Burners can be fitted to throw either a long, narrow flame or a fan-shaped flame 9 feet wide, thus doing away with the necessity of using more than one burner in any fire-box or furnace that is 9 feet or less in width.

W. N. Best Oil Regulating Cock:

This regulating cock is provided with a V-shaped, knife-edged opening in the plug, which not only has a shearing action on heavy liquid f uels, but enables the operator to secure the finest possible adjustment.



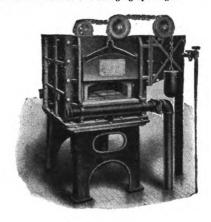
Oil Regulating Cock

When a furnace is working continuously on one class of work this cock can be set by the adjusting screw so that when the burner is stopped, it can be returned to the same adjustment when again started.

Class "D" Forge Furnace:

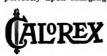
Designed especially for drop forge work, but can be used for a wide range of heating, welding, tempering, etc. By placing a muffle in the charging space makes an ideal muffle furnace. Made with one or two charging openings.





Forge Furnace

The consuming fuel unites with the air necessary for perfect combustion in the combustion chamber before it reaches the charging space of the furnace—there is therefore no oxidation of the metal while being heated. The combustion chamber and arch are of such form and proportions that the flame and heat reverberate perfectly upon charging space of the furnace.





THE MAXON FURNACE AND ENGINEERING CO.

MUNCIE, INDIANA, U. S. A.

BRANCH OFFICES

PITTSBURGH, PA.

CHICAGO, ILL. COLUMBUS, OHIO

Fuel Combustion Engineers
Burners and Furnaces for Gas and Oil

PRODUCT:

NEW YORK CITY CLEVELAND, OHIO

The sale of Maxon Premix Burners consuming gas or oil as fuel.

SERVICE:

Our engineering staff will make surveys of industrial plants relative to applying 622 the heat from the fuel best suited to obtain the results desired. Our policy is to develop increased earnings from your furnaces by the correct application of the fuel. We are prepared to redesign your present equipment or design and construct new furnaces introducing the use of Maxon Premix Burners to solve your fuel problems. We do not recommend changes on existing fuel burning equipment unless we can show a saving in fuel, power and increased production.

SUPERVISION:

We can supply you with fuel combustion engineers for supervising and making installations of Maxon Premix Burners in your plant.

APPLICATIONS:

Billet Furnaces

Boilers

Brass Melting

Brick Kilns

Carbonizing

Core Ovens

Deep Eye Pot Furnaces

Enameling Ovens

Glass Melting Day Tanks

Glazing Machines

Glory Holes

Heat Treating

High Speed Steel

Japaning Ovens

Lehrs

Plate and Angle Furnaces

Pottery Kilns

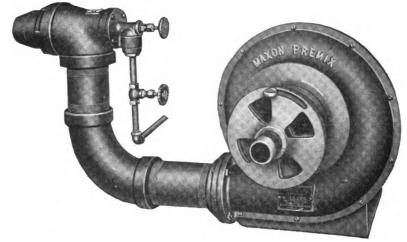
Reheating Furnaces

Soaking Pits

THE MAXON FURNACE AND ENGINEERING CO.

MUNCIE, INDIANA, U. S. A.

Fuel Combustion Engineers Burners and Furnaces for Gas and Oil



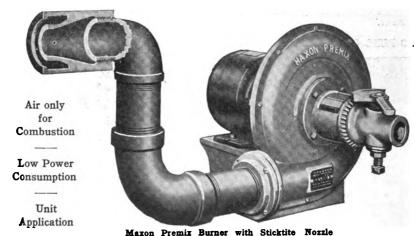
Maxon Oil Burner Equipment

623

Maxon Oil Burner is used in connection with the Premix Blower which supplies the air to secure complete combustion. Atomization is secured by the construction of the spray head from the pressure of the oil alone. No excess air—no high pressure—low operating cost.

The principle of the Premix Gas Burner is to take the gas to be burned into the inlet of the fan case and the proper amount of air that is proportioned by the Ratio Valve to support the combustion of this gas and intimately and mechanically mix the two in correct proportions for complete combustion.

Sticktite Nozzle as shown in illustration keeps the flame from blowing away from the orifice, giving many advantages in open flame and muffle work.



THE NORTH AMERICAN MFG. CO.

5902 CARNEGIE AVE., CLEVELAND, OHIO

Manufacturers of Gas and Oil Burning Equipment for Industrial Purposes



NO. I GAS-ELECTRIC PORTABLE BLOW TORCH:

A self-contained unit that requires only gas and electrical connection to put it in service.

This torch will produce temperatures up to 2500° Fahr.

The length of flame can be varied from 4 to 24 inches in length.

NO. 10 TOOL-HARDENING FURNACE:



This is a strictly high grade unit and is suitable for high speed hardening. When fired with our No. 1 Blow Torch temperatures up to 2500° Fahr. can be maintained. This method of firing makes the furnace entirely independent of other equipment.

NO. 3 FUEL OIL BURNER:



For low pressure air.

This burner will operate successfully on pressures from 3 oz. to 1 pound, and is designed for use with our No. 3 Gas-Electric Blower where no gas is available.



NO. K-2 KEROSENE FLAME-BLAST TORCH:

An improved unit of the vaporizing type, and will produce an intensely hot blue flame.

This unit will do, the same work as the Gas-

Electric Torch where no gas or electricity are available.

NO. 2 GAS-ELECTRIC BLOWER:



Used for firing, hardening, heat-treating, melting and forging furnaces. Also core ovens, japan and enameling ovens, with either natural or manufactured gas.

No. 3 GAS-ELECTRIC BLOWER:



Intended for the same class of work as

the No. 2 but has a much greater capacity.

The No. 3 fires either gas or oil and is used in connection with our No. 3 Oil Burners. These units show wonderful economy and are simple and inexpensive to install.

THE OVEN EQUIPMENT & MFG. CO.

NEW HAVEN, CONN.

Manufacturers of Crawford Sectional Ovens and Enclosed Flame Gas Burners

"CRAWFORD SECTIONAL" OVENS

are used for the following heating processes: Baking enamels and japans in all colors and heats; vulcanizing hard rubber and substitutes; baking and drying food products, armatures, insulated wire, cores, molds, and abrasives.



Type 2 Electric Oven



Drawer Oven



Flat Conveyor Oven

"CRAWFORD SECTIONAL" OVENS are heated with our ENCLOSED FLAME GAS BURNERS, ELECTRICITY, OR STEAM.

STANDARD TYPE OVENS:

These ovens are built in every size which industrial needs demand. Goods may be handled on racks, trucks, or over-head rails. The simple, rigid design for taking care of the expansion and contraction, the high grade of insulation used, positive air circulation, and accurate temperature control—all insure durability and continued successful operation with the maximum economy.

SPECIAL OVENS:

Sectional construction and standardized units lend themselves very readily to the fabrication of special ovens. Our engineering service is always available for the discussion of equipment to meet individual requirements; our knowledge, gained from long experience with oven problems of every kind, is entirely at the disposal of our customers.

CONVEYOR OVENS:

Quantity production can be speeded up to the highest point by the use of our flat or vertical conveyor equipment. We build these ovens in a variety of sizes to facilitate rapid continuous baking.

TRUCKS:

We build all-steel OVEN TRUCKS with roller bearings.

625

AMERICAN METAL TREATMENT CO.

ELIZABETH, N. J.

Case-Hardening, Annealing, Hardening, Tempering, Coloring, Etc.

Our Specialties:

CASE-HARDENING HARDENING
ANNEALING TEMPERING
GUN METAL COLORING, ETC.



Fractured Ball Race

We case-harden in bulk parts in the following lines:

Ball Races
Bushings
Cams
Canning Machine Cams
Gears, Spur Bevel and Worm
Hoisting Engine Parts
Pins and Shafts
Printing Press Parts
Rolls for Various Purposes
Screw Machine Products
Sprockets
Stampings of all kinds
Typewriter Parts

Adding Machine Parts

626

SEE
OUR ADVTS IN
MECHANICAL
ENGINEERING
THE JOURNAL OF THE
A 5 M-E

Solid and Hollow Spindles for Screw Machines, Lathes and Grinding Machines, Wrist Pins and Sleeves for Automobile Engines and the largest Stationary Engines.

Improved Method of "Local" Case-Hardening:

Our method of local case-hardening makes it unnecessary to protect piece by banding or coating the portions desired soft; and it reduces warping. The blank is roughed out to grinding limits at the places to be hardened. After carbonizing—the carbonized skin is removed from the "soft places." The piece is now heated and quenched at the desired temperature. The "soft places" can now be machined to size.

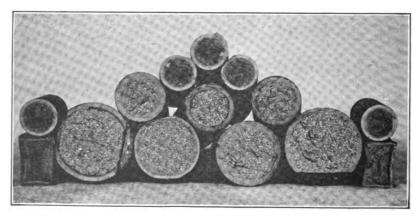
If you have a proposition adapted to that treatment call upon our engineering staff for recommendations and advice.

"Carbonia" Finish:

"Carbonia" Finish is a kind of Gun-Metal finish for steel and iron parts, though of a deeper, richer black than the average Gun-Metal.

"Carbonia" was first applied to clothing buttons and buckles, then harness and saddlery hardware. It has been adopted by nearly all of the larger fire-arms manufacturers of the country and now is used on electrical, typewriter and adding machine parts. It is also applicable to the humbler metal goods—such as shoelace tips, etc.

This finish is not rust-proof; but is a very good protector.



Samples of Case-Hardening by the Gas Process

ELECTRIC ARC CUTTING AND WELDING COMPANY

222 HALSEY STREET, NEWARK, N. J.

Manufacturers of Portable Electric Alternating Current Apparatus for Cutting and Welding Metals



PORTABILITY:

Our standard machine weighs but 265 lbs. and is readily portable, compact and easy to handle. It is fitted with sedan handles so that two men can easily handle it. Our machine will operate when upside down, or in any position.

HEAT:

Not until the advent of Alternating Current Electric Arc welders has there been a means of keeping heat at the arc constant. This apparatus is so designed that a rising of voltage is offset by a lowering of current and vice versa. No form of constant current apparatus can maintain uniform heat at the arc because the resistance and, therefore, the C2R of the arc is variable. The Alternating Current welder, because it is a special type transformer, provides a great economy in first cost, weight, maintenance, installation, and because of its high electrical efficiency, high penetration, and speed of welding.

EFFICIENCY:

The transformer has the highest efficiency of any piece of electrical apparatus.

POWER SUPPLY:

Our machine can be designed to meet any ordinary voltage or frequency. It is made single-phase. No expensive cables; standard wire is all that is required on wiring done on primary side.

MAINTENANCE:

The life of a transformer, having no moving parts, is practically indefinite. It need never be replaced unless through careless handling or accidental injury.

PENETRATION AND SMOOTH DE-POSITION:

Our machine is the first one which has proven satisfactory in the welding of cast iron. The welds made of cast iron by our apparatus are guaranteed, provided the original cast iron is the same cross-sectional area as the weld. Our machines excel in the smooth deposition of the metal, its greater ductility and elongation, and the absence of electrolytic corrosion.

SPEED OF WELDING:

627

With Alternating Current there is no polarity and therefore the speed is faster than D. C. machines. This has actually been the result of competitive tests.

USES:

Production work on tanks, housings, and all steel construction work.

Repair of all machine parts.

Boiler Repairs.

Building up of worn parts.

Filling in of mispunched, misbored holes, or surfaces incorrectly machined.

"NEWARC" ELECTRODES:

Our flux coated electrodes are superior to bare electrodes and do faster and safer work. The flux chemicals tend to exclude oxygen and nitrogen of the air from the arc and good clean metal welds result: Welding failures are frequently traced to oxides and nitrides of iron in welds.

We will be pleased to furnish you with literature, catalogues and engineering service to help you solve your welding problems.

QUASI-ARC WELDTRODE CO., INC.

ATLANTIC AVE. AND WARWICK ST.

BROOKLYN, NEW YORK

BRANCHES IN ALL FOREIGN COUNTRIES

AGENTS IN PRINCIPAL CITIES OF U. S. A.

Manufacturers and Dealers in Electric Welding Apparatus and Quasi-Arc Patented Coated Electrodes. Patentees of Designs and Methods for Welded Ship Construction

WELDING EQUIPMENT:

By this system equally good results are attained with either Alternating or Direct Current.

For use with Alternating Current or any voltage, phase or frequency, we supply inexpensive transformers for the proper reduction of voltage; and Resistance-Controllers (shown below) for accurate regulation of current.



628

Standard Resistance-Controller

For use with Alternating or Direct Current at 80-110 volts. Size 18" x 18" x 16". Weight 75 lbs. Cost of complete apparatus (transformer, controller and all accessories) for one operator, less than \$500.



Standard Reaccance-Controller

For use with Direct Current only at 50-60 volts. Size 11" x 18" x 18". Weight 100 lbs. This Controller replaces the old-style auxiliary-welding-panel of all multiple-operator sets, gives much closer regulation of current, and is a great time saver becausefalways close to the work.

When conditions require the use of welding generators, we supply them in all sizes, driven by direct-coupled motor, or gas engine. These generators give constant potential current at 50 volts. Price according to size and method of drive.

WELDING ELECTRODE:

These are the original Coated Metal Electrodes, which are fully protected by U. S. and foreign patents. Should not be confused with the inferior imitations now on the market, or with the "dipped" or "painted" electrodes sometimes offered as a substitute.

After the most extensive and exacting tests, the genuine Quasi-Arc "weld-trodes" have received the official approval of Lloyds Register of Shipping for use in ship construction.

Welds made with these electrodes—Have not only exceedingly high tensile strength and elongation, but also singular endurance under alternating stresses which quickly destroy welds made by other methods.

Are soft and ductile, permitting easy chipping, caulking or machining.

Will not corrode, because of the purity of the deposited metal.

Are made at a speed of 30-50% faster than can be attained with bare, or "dipped" electrodes.

Require only 50-60% of the amperage necessary to fuse bare electrodes of the same cross-section.

The Electrodes are made in diameters of 14 to 4 S. W. G.; and of special compositions for use on Mild Steel, Carbon Steel, High Manganese Steel and Cast Iron

Our Engineering Department will assist in all welding problems, and will guarantee results on work done under its supervision.

Catalogs, estimates and other information on request.

ENGINEERING

THE ELECTROLABS COMPANY

MAIN OFFICE AND WORKS, PITTSBURGH, PA.

BRANCH OFFICES

PHILADELPHIA

NEW YORK

SAN FRANCISCO

Manufacturers of Complete Plants for the Production, Distribution, Compression and Utilization of Oxygen and Hydrogen Gases

USES AND COMPARATIVE COST:

The Oxy-Hydrogen Generator manufactured by us under the Levin patents is for use wherever an uninterrupted, pure supply of oxygen, hydrogen, or both of these gases are required.

The cost of oxygen by the Electrolabs System is but one-third the price you pay for cylinders, and in addition to the oxygen, you get twice its volume of hydrogen free. Space required is no greater than that which you now use for cylinder storage.

CONSTRUCTION AND SIZES:

The generating cell is manufactured on the unit principle. By building or uniting these units into batteries any desired volume of gas may be obtained.



Electrolabs Generator, Type "B"

The design and construction is simple, rigid and compact. Production methods are used in manufacturing thereby obtaining a product always of the same high quality with interchangeable parts. As the material used in the construction of the cell will not deteriorate or decompose under the influence of the electrochemical action of the cell, Electrolabs generators enjoy the distinctive advantage of being delivered as an entirely welded, completely assembled, rigid unit.

Specially designed sight-feed indicators are placed between generator and gas offtake pipe.

Electrolabs generators have no maintenance or replacement expense for packing joints—they have no joints to pack. There are no bolts to insulate—no leaks to remedy.

Units made in two sizes:

Type A—Delivers 2 cu. ft. of Oxygen and 4 cu. ft. of Hydrogen each hour at 250 amperes.

Type B—Delivers 4.8 cu. ft. of Oxygen and 9.6 cu. ft. of Hydrogen each hour at 600 amperes.

SAFETY:

The safety of a gas generating set depends upon the continuous purity of the gas produced. Users of Electrolabs equip-



Plant of the Paschall Oxygen Co. 1000 Electrolabs Generators, Type "A"

ment report that the purity of gases coming direct from the generators is 99.8% and better.

OUR SERVICES:

Not only do we manufacture the entire equipment but we also arrange and assume entire responsibility for the installation of the complete plant. We guarantee prompt deliveries and make them.

We have the privilege, through the courtesy of owners, of referring you to plants where you may see our equipment in successful operation. Engineers desiring to take advantage of this opportunity, please write us.

As specialists in oxygen and hydrogen gas generation we are always pleased to discuss problems in our field. Our accumulated experience is at your command.

INTERNATIONAL OXYGEN CO.

NEWARK, N. J.

Manufacturer of Generators for Oxygen and Hydrogen; Pressure Regulating and Reducing Valves for High Pressure Gases; Gas Testing Apparatus and Cylinders; Distilling and Hydraulic Testing Apparatus; Oxygen and Hydrogen Gases in Cylinders



Bank of 15 I. O. C. Type 4—1000 Oxy-Hydrogen Generators

I.O.C. TYPE 4-1000 OXY-HYDROGEN GENERATOR:

These generators of the unit or single cell type have set a new standard of economy in gas production.

Each generator is complete in itself, making pure oxygen and pure hydrogen at a rate determined by the amperage of the electric current supplied.

Each unit requires floor space of 4" x 42" and with necessary pipe connections needs head-room of about 7 feet. The normal capacity of this generator per unit of floor space is 200% greater than any other apparatus on the

Practically no organic material enters into its construction. There are no moving parts, therefore no wear. The materials used are practically time-proof and immune to chemical action or deterioration.

ELECTRICAL EFFICIENCY:

At normal current of 600 amperes, each cell, with an electrolyte of caustic soda solution, requires 2.0 volts and has a guaranteed capacity of 4.8 cu. ft. of oxygen and 9.6 cu. ft. of hydrogen per clock hour. The electrical efficiency is 4.0 cu. ft. of oxygen and 8,0 cu. ft. of hydrogen per kilowatt hour.

A normal current of 600 amperes is stated because, at the common current rates, the cell operated at this amperage shows the most economical adjustment between installation cost and operating cost.

Below 600 amperes, a slightly higher electrical efficiency is obtained but the gas output per cell diminishes. Above 600 amperes, the electrical efficiency diminishes slightly while the output per cell increases.

When the demand falls below normal. current can be saved by running the plant on a lower amperage, thus securing the smaller gas output needed at a higher electrical efficiency. As gas requirements increase, a higher amperage can be used and a larger output secured.

It is practical to operate, at a range varying from less than 200 amperes to upwards of 1000 amperes-or at a ratio of more than 1 to 5.

Capacities-I. O. C. Type 4-1000 Unit Generator

No.	Capacity in Cu. Ft. per 24 Hours							
of	At 600	Amperes	At 1000 Amperes					
Cells	Oxygen	Hydrogen	Oxygen	Hydrogen				
25	2880	5760	4800	9600				
50	5760	11520	9600	19200				
75	8640	17280	14400	28800				
100	11520	23040	19200	38400				
150	17280	34560	28800	57600				

PURITY OF GASES:

I. O. C. Type 4-1000 Generators are guaranteed to produce gases of a minimum purity of 99.5% for oxygen and 99.75% for hydrogen. Experience, however, shows oxygen averaging 99.7% pure and hydrogen over 99.9% pure.

I. O. C. ENGINEERING SERVICE:

The Company designs, installs and puts into operation oxy-hydrogen plants complete in every detail-not alone I. O. C. generating apparatus but also such purchased accessories as motor-generators, switchboards and control apparatus, compressors, gas holders, piping systems, and apparatus for utilizing the gases.

Or the Company will, in connection with the purchase of its own apparatus, prepare plans for OURADITEM
the complete installation and MECHANICAL
ENGINEERING furnish specifications covering all accessories.

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Compressors, Blowers, Pumps, Hydraulic Machinery, Industrial Machinery, Steel Plate Work

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CHICAGO PNEUMATIC TOOL CO.

CHICAGO PNEUMATIC BUILDING: 6 E. 44TH STREET, NEW YORK

SALES AND SERVICE BRANCHES ALL OVER THE WORLD

Electric Drills, Air Drills, Pneumatic Hammers, Oil, Gas and Steam Engines, Air Compressors

"CHICAGO PNEUMATIC"

Depend upon that Name

for

Chicago Pneumatic Air Compressors; Giant Engines. Little Giant Electric Tools: Portable Drills, A. C., D. C., and Universal types; Drilling Stands, Track Drills, Spike Drivers; Grinders, A. C., D. C., and Universal types; Universal Precision Grinders, Hammer Drills. Pneumatic Tools: Boyer Riveting and Chipping Hammers, Stone Tools, Sand Rammers, Holder-Ons, Jam and Yoke Riveters; Little Giant Pneumatic Drills and Grinders; Pneumatic Geared Hoists, Winches and Motors, Air Hose, Accessories, etc.



Little Giant Electric Drills

Made in a complete line for operation
on A. C., D. C. and Universal Current.



Little Giant Air Drills

Made in a wide variety of types and sizes for drilling, wood-boring, reaming, tapping, screw setting, nut and bolt tightening, etc.

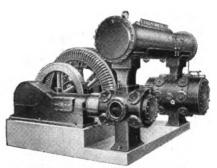
Boyer Pneumatic Hammers

Standard the world over for riveting, chipping, calking, flue beading, scaling, etc.



Giant Oil Engines

Made in single and duplex types, sizes 12 to 200 H. P. Built also for operation on gas and steam.



Chicago Pneumatic Air Compressors

"The Compressor with the Simplate Valve." Made in capacities up to and including 5000 cu. ft. per min., for electric, steam, belt, oil, gas and gasoline



drive. Over 300 distinct types and sizes, both stationary and portable.

O TO

TRADE MARK

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INGERSOLL-RAND COMPANY

11 Broadway, NEW YORK

Boston, Birmingham, Butte, Chicago, Cleveland Denver, Detroit, Duluth, El Paso, Houghton, Juneau, Knoxville, Los Angeles, New Orleans, Philadelphia, Pittsburgh, St. Louis, New York, Atlanta, Dallas, Washington, Salt Lake City, San Francisco, Scranton, Seattle

Builders of Pneumatic Machinery

Air and Gas Compressors-Turbo Blowers-Vacuum Pumps-Air Lift Pumping Systems-Condensers-Pneumatic Riveting and Chipping Hammers, Drills, Wood Boring Machines, Sand Rammers, Hoists, Rock Drilling and Metal and Coal Mining Machinery-Tie Tamping Outfits

Ingersoll-Rand and Imperial Reciprocating Air and Gas Compressors:

High grade, efficient machines of modern design, capable of continuous, high duty service.

"Imperial Fourteen," belt driven, vertical machines range in capacity between 3 and 45 cu. ft. per minute at pressures to 150 lbs. per square inch. Bulletin 3039.

Ingersoll-Rand Class "ER," power, and Class "FR," steam, are single stage in capacities between 28 to 1086 cu. ft. per minute at pressures between 10 to 125 lbs. per square inch. Bulletins 3230 and 3131.

"Imperial" Type "XB," belt driven,
Type "X," Meyer valve steam engine,
and Type "XPV," piston valve steam
engine driven duplex machines are to be
had either single or two stage in capacities
from 176 to 4219 cu. ft. per minute and
for pressures between 15 to 110 lbs. per
sq. inch. Bulletins 3312, 3311 and 3033.

"Ingersoll-Rand" Class "PRE," electric driven and Class "ORC," Corliss engine driven machines are duplex units of large capacity. Bulletins 3126 and 3129.



The Company is also prepared to build compressors to meet special conditions of service.

Ingersoll-Rand Turbo Compressors:

Direct connected steam turbine driven multi-stage centrifugal compressors for handling volumes from 3500 to 10000 cu. ft. per minute at pressures to 100 lbs. per sq. inch.

Ingersoll-Rand Turbo Blowers:

Turbo blowers for blast furnaces, copper and lead smelters, Bessemer converters, single-stage blowers for foundry cupolas, oil burners and other low pressure requirements.

Built direct connected to low, mixed or high pressure steam turbine, electric motor or Pelton Wheel.

Capacities from 3000 cu. ft. per minute on up at pressures from 1 to 100 lbs. per sq. inch.



Ingersoll-Rand Condensing Equipment:

Counter-current barometric, low level multi-jet and high vacuum surface condensers, I-R vacuum pumps and Cameron circulating water pumps. Built to meet all service conditions in turbine and engine work and with vacuum pans, evaporators, dyers, etc.

I-R Barometric condensers can be used continuously with acid or gritty cooling water without necessitating cleaning or repair. Maintain highest vacua with less cooling water. Bulletin 9124.

For description of low level multijet see Bulletin 9032. For surface condenser see special literature.



INGERSOLL-RAND COMPANY

"Ingersoll-Rand" and "Imperial" Dry Vacuum Pumps:

Built for service wherever a highly efficient machine is wanted to maintain vacua up to 26-29.5 ins. mercury (referred to 30" barometer). High speed machines that require less than half the usual floor space.

"Ingersoll-Rand" Class "ER," belt driven, and Class "FR," steam driven straight line units range in capacity from 292-2295 cu. ft. per min. Bulletin 3137.

"Imperial" Type "XB," belt driven, and "Imperial" Type "X," steam driven are duplex machines built in capacities from 1048 to 7058 cu. ft. per minute. Bulletin 3138.



"Little David" Pneumatic Tools:



Simple, sturdy and efficient tools built in a complete range of types and sizes—a tool for every duty.

Little David Drills-28 sizes.

Little David Wood Borers-4 sizes.

Little David Portable Grinders-3 sizes.

Little David Riveters-5 sizes.

Little David Chippers-8 sizes.

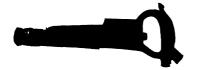
Little David (Bench and Floor) Sand Rammers.

Little David Air Motor Hoists—1/2 to 5 tons.

I-R Drift Bolt Driver.

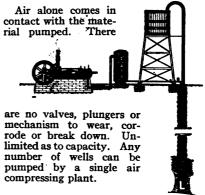
Little David Calking Machine.

Catalog 8000.



Air Lift Pumping Systems:

For pumping deep wells, flowing salt or oil wells, elevating corrosive or gritty fluids, handling acids, pumping marl or pulpy mixtures, handling sewage, unwatering mines, etc.



Catalog 76A.

Other Ingersoll-Rand Products:

"Jackhamer" Rock Drills for drilling down holes to 25 feet. Hand held.

635

"Ingersoll-Rand" Drills. Mounted type for tunnel driving and mining.

"Stopehamer" Rock Drills for up-hole

"Sergeant" Drills for deep hole and subaqueous drilling.

"Ingersoll-Rand" Sharpeners for making and resharpening bits, making bolt heads and light forgings.

"Calyx" Core Drills for prospecting and testing rock strata and formations underlying earth's surface.

"New Ingersoll" Punching Machines and "Radialax" column mounted cutters for coal mining.

"Little Tugger" Hoists for use wherever portable hoisting or hauling power of 1/2 ton capacity is reached.

"Imperial" Tie Tampers for compacting railroad ballast of any sort on steam or electric lines.

"PR" Heavy-Oil Stationary and Marine Engines for all general purposes.

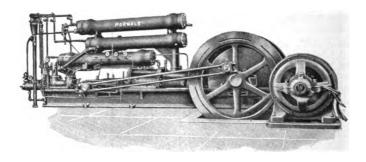
Catalogs describing any of the products of the company will be sent you gladly upon request. Address the nearest office.

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THE NORWALK IRON WORKS CO.

SOUTH NORWALK, CONN.

Pioneer Builders of Compressors for Air, Oxygen, Hydrogen, Acetylene, Carbonic Acid Gas



24-inch Stroke Chain-Driven Four-Stage Air Compressor

NORWALK AIR AND GAS COMPRESSORS:

A standard line of single-, two-, threeand four-stage compressors for air or any of the commercial gases. Built in any size and for any pressure up to 7500 pounds per square inch. Each Norwalk Compressor is scrupulously tested before it leaves the factory.

Norwalk compressors are approved by engineers for every branch of air or gas compression service. They are in use in every state in the union.

Norwalk machines meet the individual requirements of the purchaser. If you have an unusual problem in air or gas compression our engineers will coöperate with you. You are invited to make use of our forty years' experience in compressor building.

Some of the outstanding advantages of Norwalk machines are: uniform air pressure; automatic regulation; high speed, light weight; small floor space; central balanced stresses; inexpensive foundations; complete cooling system; all parts easily accessible; full load, part load or no load as required; intake valves with mechanical movements.

Ammonia Compressor Refrigerating Plants also are manufactured by the Norwalk Iron Works Company and can be supplied for any capacity from ¼ ton to 25 tons.

Bulletins on Air, Oxygen, Hydrogen, Acetylene and Carbonic Acid Gas, or on Refrigerating Plants, will be sent upon request.

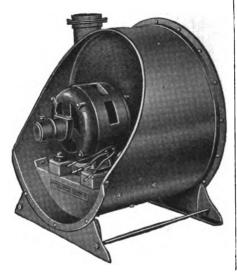
THE SPENCER TURBINE COMPANY

HARTFORD, CONN.

Turbine Blowers and Exhausters, Spencer Turbo Compressors, Spencer Steel Organblowers, Spencer Turbine Vacuum Cleaner Systems

SPENCER TURBO COMPRESSOR:

Slow speed, low velocity, wide clearance, multi-stage turbine.



The Turbo Compressor retains its efficiency permanently; no contacts or even close clearances, hence no chance for wear.

Direct connected, self-contained unit avoids necessity for belts, gears or chains, with their resultant losses and noises.

Constant pressure with no pulsations and no surging.

Current consumption inherently decreases in proportion to reduction of 637 volume of air used, eliminating all auxiliary governors.

Write for Complete Bulletin.

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Catalog Volume, cu. ft. per min.				Vol., cu. ft. per min.	Catalog Number	Vol., cu. ft per min.
600	1507	675	2010	600		
		900	2015	1000		
1300	1515	1350	2020	1300		
2000	1520	1800	2025	1650		
2700	1525	2250	2030	2000		
3350	1530	2700	2035	2350		
4000	1535	3150	2040	2700		
4700	1540	3600	2050	3350		
5400	1550	4500	2060	4000		
6750	1560	5400	2075	5000		
8100	1575	6750	20100	6700		
10000	15100	9000	20125	8100 10000		
	Volume, cu. ft. per min. 600 1000 1300 2000 2700 3350 4000 4700 5400 6750 8100	Volume, cu. ft. per min. Number 600 1507 1000 1510 1300 1515 2000 1520 2700 1525 3350 1530 4000 1535 4700 1540 5400 1550 6750 1560 8100 1575	Volume, cu. ft. per min. Catalog Number Vol., cu. ft. per min. 600 1507 675 1000 1510 900 1300 1515 1350 2000 1520 1800 2700 1525 2250 3350 1530 2700 4000 1535 3150 4700 1540 3600 5400 1550 4500 6750 1560 5400 8100 1575 6750	Volume, cu. ft. per min. Catalog Number Vol., cu. ft. per min. Catalog Number 600 1507 675 2010 1000 1510 900 2015 1300 1515 1350 2020 2000 1520 1800 2025 2700 1525 2250 2030 3350 1530 2700 2035 4000 1535 3150 2040 4700 1540 3600 2050 5400 1550 4500 2060 6750 1560 5400 2075 8100 1575 6750 20100		

SULLIVAN MACHINERY COMPANY

120 So. MICHIGAN AVE., CHICAGO

BOSTON

PITTSBURGH

30 Church St., NEW YORK

St. Louis

SAN FRANCISCO

Sullivan Air Compressors, Gasoline Extraction Compressors, Air Lift Pumps, Rock Drills, Channelers, Hammer Drills, Drill Sharpeners, Coal Mining Machines, Quarrying Machinery, Diamond Core Drills, Core Drilling Contractors, Forge Hammers, Drill Steel Furnaces, Vacuum Pumps

AIR COMPRESSORS:



Angle Compound. Bulletin 75-SS

ANGLE-COMPOUND power driven compressors are economical of floor space and secure efficiency through exact balancing of reciprocating parts. For belt or direct connection; single or twin units, 400–2800 cu. ft., equipped with END-ROLLING FINGER VALVES.



"WB-3" type; Bulletin 75-ES

Straight Line Steam-driven Compressors, single (WA-6) and two-stage (WB-3), are available in sizes to 1000 feet. Meyer and plain slide steam valves, "Wafer" air valves, abundant cooling area; strength and wearing qualities are emphasized.



Belted, Single Stage. Bulletin 75-RS

Single Belted Compressors:

"WG-6," range from 60 to 400 feet capacity, are splash oiled and have "Wafer" valves. Vacuum pumps and gasoline extraction compressors are also built, and portable, gasoline engine driven units.

HAMMER DRILLS:

Rotators are all around, on e-man of drilling machines, weight 38 lbs. capacity, holes 6 to 14 feet deep. Automatic piston type rotation, steel retainer, hole-cleaning air jet and differential, independent valve are features. Seven types and two mountings to select from.





AIR LIFT PUMPS:



The Sullivan Air Lift secures more, purer, cooler water from your wells, than other methods of pumping. Simplicity, reliability, sustained efficiency and central control are important features. Acids and chemical solutions handled efficiently on low submergences.

Bulletin 71-DS.

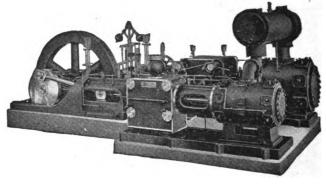
WORTHINGTON PUMP AND MACHINERY CORPORATION

115 BROADWAY, NEW YORK

LAIDLAW WORKS: Cincinnati, Ohio

Branch Offices in All Principal Cities

"Feather" Valve Air Compressors, Vacuum Pumps, High Duty Pumping Engines

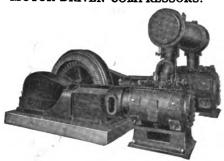


Corliss "Feather" Valve Compressor ("Feather" Reg. U. S. Pat. Off.)

HEAVY DUTY CORLISS COM-PRESSORS:

Where a large capacity is needed, Worthington Steam-Driven Compressors are made with full releasing, automatic Corliss steam gear, embodying every refinement and improvement found in the best Corliss power engine. The compressor end is identical with that used on power-driven compressors.

MOTOR DRIVEN COMPRESSORS:

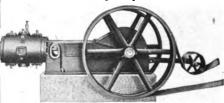


Worthington Feather Valve Power-Driven Compressors are driven by either direct-connected engine type motor, or by belt or rope drive. The

unique feature of these machines is found in the use of the Worthington Feather Valve; efficiency, durability and noise-operation are thus secured. Worthington Power-Driven Compressors are either single, two-stage or multi-stage. They are built for any working pressure up to 3500 lbs. per sq. in.

SMALL COMPRESSORS:

The same refinement of detail, and the same rugged construction, which characterize the larger Worthington Air Compressors are found in the smaller ones. Single-belt and steam-driven compressors are built in capacities ranging from 100 cu. ft. per min. and for pressures ranging from 30 to 100 lbs. per sq. in.



Single-Stage Belt-Driven Feather Valve Compressor

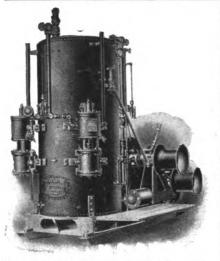
(See page 180 for additional products of this Company)

WESTINGHOUSE TRACTION BRAKE COMPANY

FACTORIES: WILMERDING, PA., AND MILWAUKEE, WIS.

Atlanta, Ga. Boston, Mass. Chicago, Ill. Columbus, O. Denver, Col. Houston, Tex. Los Angeles, Cal. Mexico City New York, N. Y. Pittsburgh, Pa. San Francisco Seattle, Wash. St. Louis, Mo. St. Paul, Minn. Washington, D. C.

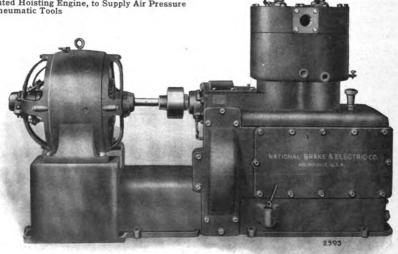
Manufacturers of Westinghouse and National Steam-, Motor- and Belt-Driven Compressors and Accessories



The Westinghouse 9½" locomotive air compressor is a compact, rugged type of machine, designed for the rigors of rail-way use. It is especially adapted to rough usage by outside contractors and others requiring a dependable and self-contained machine of this character. Thousands are in industrial service today. See Publication 9012.

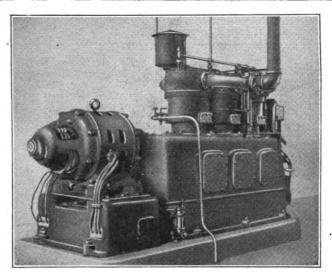
Westinghouse motor driven air compressors are compact, self-contained, direct connected, and ideally suited to service in all lines of industrial and commercial plants. Capacities, 4 cu. ft. to 550 cu. ft. See Catalogue 9035.

Two 9½" Westinghouse Railway Locomotive Air Compressors Installed on a Portable Skid Mounted Hoisting Engine, to Supply Air Pressure for Pneumatic Tools



Type E Water-Jacketed Compressor with Direct Current Motor. Displacement, 50 to 110 Cu. F 1 When Operating against 90 Lbs. Pressure. For Continuous Operation

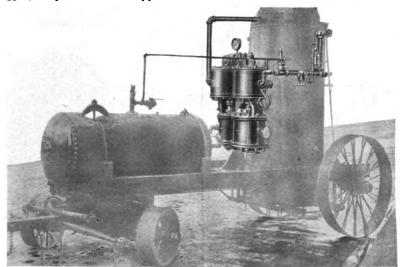
WESTINGHOUSE TRACTION BRAKE COMPANY



Westinghouse-National 3VS, Water-Jacketed, Direct Connected, Herring-Bone Gear and Pinion Automatic Control, Installed in a Prominent Chicago Foundry

The Westinghouse-National 3VS type of compressor is especially adapted to general factory and shop uses for the operation of all pneumatically operated devices such as pneumatic tools, air hoists, blacksmith forges, paint spraying, etc., is rugged, compact and of neat appearance.

The Westinghouse 10½" Cross Compound locomotive air compressor is exceedingly well suited to rough work of any contractor requiring compactness, reliability of action, low maintenance cost and minimum of attention. See Publication 9033.



Westinghouse 10 1/2" Cross Compound Locomotive Air Compressor, Mounted on Portable Truck and Used by New England Contractor for Operating Two Jack Hammers and Three 3/4" Tripod Drills

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AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN

Traps; Fans and Blowers for All Purposes

Manufacturers of Heating, Ventilating, Cooling, Purifying, Humidifying, Drying, Mechanical Draft and Blast Equipment; Vertical Self-Oiling Steam Engines, Steam



SYSTEM OF PURIFYING, COOLING AND HUMIDIFYING:



For Purifying and Humidifying air in Schools, other Public and Semi-Public Buildings.

For Humidifying and Cooling air in Textile Mills, Food and Con-fectionery Plants, Printing Houses, and other Industrial Plants.

For Dehumidifying and Cooling in Candy Factories, Bakeries, Factories, I Photo Film Rooms, Blas Film Drying Blast Fur-

Fig. 1

naces, Electric Generators, etc.

Capacities from 3,500 C. F. M. to 350,000 642 C. F. M.

Write for "detail" information.

Fig. I shows "Sirocco" Air Purifier, Cooler and Humidifier.

MULTI-BLADE FANS AND BLOWERS:

For Heating, Venti-lating and Cooling in Public, Office, In-dustrial and Educational Buildings.

For Drying Mechanical Draft.

Sirocco Multi-Blade Fans will handle more air, consuming less power than the ordinary steel plate fan, having twice wheel diameter.

Built with capacities of from 75 C. F. M. to 1,000,000 C.F. M.



Fig. 2



Complete specifying information at your request.

Fig. 2 shows
"Sirocco" Multi-Blade
Fan for Pulley,
Motor or Engine Drive.

Fig. 3 shows "Sirocco" Multi-Blade Fan Wheel. Fig. 3

"ABC" EXHAUST FANS FOR EXHAUSTING AND CONVEYING SYSTEMS:

Exhaust shavings, dust and refuse from woodworking plants.

Take away the dust from emery grinders, buffing and polishing wheels.

Remove smoke and gases from forge fires.

Exhaust the dust from cement plants, flour mills and similar plants.

Remove steam and vapor from vats and kettles in breweries, packing houses, textile and rubber factories.

Elevate and convey cotton and wool in textile

There is a size and type to meet any requirement

Capacity tables and complete data sent on request.

Fig. 4 shows Type "A" Fan for pulley drive. This



and other types are furnished also with direct connected motors.

TYPE "P" SPECIAL STEEL PRESSURE BLOWERS FOR FURNACE AND CUPOLA SERVICE:

For supplying draft to Oil and Gas Furnaces; Cupolas; Sinter-ing, Smelting and Pulverized Coal Machines.

For blowing scale from dies in drop forge plants.

Bearings being on independent foundations preclude vibra-tion in the housings. Built to discharge at any Built to angle, against pressures from 1 to 24 ounces.



Ask for complete working data.

Fig. 5 shows Type "P" Special Steel Pressure Blower. Designed for direct connection to electric motor.

AMERICAN BLOWER COMPANY

ATLANTA, BOSTON, CHARLOTTE, CHICAGO, CINCINNATI, CLEVELAND, COLUMBUS, DALLAS, DENVER, DETROIT, GRAND RAPIDS, INDIANAPOLIS, KANSAS CITY, LOS ANGELES, MILWAUKEE, MINNEAPOLIS, NEW YORK, OMAHA, PHILADELPHIA, PITTSBURGH, ROCHESTER, SAN FRANCISCO, SALT LAKE CITY. ST. LOUIS, SEATTLE, WASHINGTON



VERTICAL SELF-OILING, STEAM ENGINES:

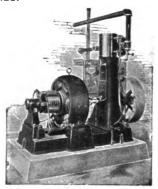


Fig. 6

Type "A"—Single Cylinder—Engines develop up to 60 H. P. For school or other work where steam pressure is limited to 30 pounds—advocate Type "A" Low Pressure Engines, develop up to 40 H. P.

Type "E"—Double Cylinder—Engines develop up to 120 H. P. This engine is advantageous where more than 40 H. P. and fairly high rotative speed are required and only small space available.

Complete information on all types at your re-

Fig. 6 shows "ABC" Engine direct-connected to dynamo for generating electric current.

AUTOMATIC STEAM TRAP SYSTEMS:



Fig. 7

Non-Return, Vacuum, Lifting and Combination.

For all steam systems under all

pressures.

The hot condensation is returned direct to the boiler automatically—at a temperature nearly equal to that at which it is condensed.



A few applications—Lumber Dry Kilns; Brick Tunnels; Vacuum Pans; Steam Cooking Kettles; Laundry, Veneer and Paper Machines (Heating Systems—Gravity Return—Vacuum); Vulcanizers; Hot Rolls, etc.

Any condensation handling problem can be economically solved by the use of "Detroit" Traps.

Let us send you full data.

Fig. 7 shows "Detroit" Automatic Return

"V" UNIVERSAL BLOWERS AND EXHAUSTERS:

Four angles of discharge right and hand drive and four angles of dis-charge left-hand drive can be made from one Type "V" Universal Fan (aside from various angular dis-charges). For all Blowing and Exhausting work requiring up to four ounces pressure.





Fig. 8

Write for latest Bulletin.

Fig. 8 shows Type "V" Bottom Horizontal Right-Hand Universal Fan. Pulley drive.

"VENTURA" DISC VENTILATING FAN:

For delivering large volumes of air at low pressure or against small resistances.

Low price—Small power consumption and in-expensive to install.

For ventilating rooms and buildings—Ventura, motor driven, ventilating fans, 650 C. F. M. to 17,500 C. F. M.

ventilating small mines or at any mine where a disc fan can be used engine or m ot or driven—from 12,000 C. F. M. to 100,000 C. F. M. resistance not to exceed 1" W. G.

Write for complete information.

Fig. 9 shows Ventura motor driven ventilating fan.



Fig. 9

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THE ALLINGTON & CURTIS MFG. CO.

SAGINAW, MICH.

Incorporated 1888

SAGINAW, MICH.

FACTORIES:

CHARLESTOWN, MASS.

ondinin, mic

OFFICES:

PHILADRI PHIA

BOSTON

Dust and Shavings Collecting Systems. Positive Long Distance Conveying Systems

PRODUCT:

We design, manufacture and install systems for gathering shavings, sawdust, leather and metal dust from buffing and grinding operations, lint from textiles, fumes from paint sprays, etc. Also long distance pneumatic conveyors for hogged chips, shavings, etc.; and automatic wood waste furnace stokers.

OPERATION:

A gathering system consists in pipes leading from the machines or points from which materials are to be gathered, to a centrifugal fan and from the fan to a collector located above the point at which the material is to be deposited. The suction in each pipe is adjustable to meet that machine's requirements without waste. The fan is the slow-speed low-power type developed by us in 1905. The collector is the "back-pressure-proof" type (absolutely free from centrifugal resistance) which does not impose unnecessary resistance on the fan discharge. The materials are delivered to the collector by the air current produced by the fan, and are there allowed to fall by gravity, while the comparatively clean air escapes at the top.

A conveyor system for heavy materials or long distances (400 to 4,000 feet) consists in a positive high pressure blower; a charger which receives the material by gravity and introduces it into the pipe from the blower against

the pressure therein; the necessary pipe line and a collector at the end. The material is moved continuously and automatically.

A wood-waste stoker for sawdust, shavings, hogged chips, etc., consists in a non-arching tank to temporarily store the fuel as delivered at varying rates from the machines, and specially designed screw conveyors which deliver the material to the furnace at an absolutely uniform rate. Rate of feed being adjustable to suit the fuel and the fire needed.

WHAT OUR SYSTEMS WILL DO:

Take refuse and dust from machines with less power than the ordinary system.

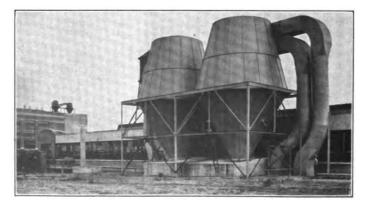
Automatically handle heavier materials and a greater volume and longer distances than otherwise possible.

Give the highest firing efficiency known for wood fuel.

SERVICE:

Each system is designed and manufactured to exactly meet the local conditions. Our engineers are at your disposal to submit a report on the improvements and power saving possible on a system already installed or to help you in making proper provision in advance for suitable installations in a new project.

We have a message of special importance to the large manufacturer where our Central Suction Unit or Tower system is indicated.



Collectors of gathering systems and in the background collectors of conveyor systems. Chargers are located below the large collectors and pipes lead underground to the smaller collectors. The above at The St. Louis Mfg. Corpn. (General Motors Corpn.), St. Louis, Mo. (To form idea of size, note man at right.)

NEW YORK BLOWER COMPANY

FACTORIES:

BUCYRUS, OHIO

LAPORTE, IND.

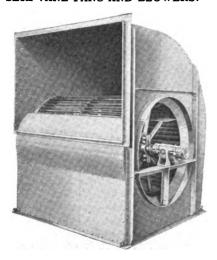
MAIN OFFICE: CHICAGO, ILL.

BRANCH OFFICES: All Principal Cities

Sole Manufacturers of Seri-Vane Fans, Blowers, Exhausters, Peerless and Reversible Shaving Fans, Peerless Ventilators and Diffusers, Peerless Air Washers and Humidifiers

Seri-vane fans, blowers, etc., are made in such a wide variety of sizes and styles that their application is practically un-limited. For each and every engi-neering problem, we make a particular and distinctive size best suited for results to be obtained, space conditions, etc. While we can supply fans, blowers, air washers, etc., to fill any specifications, we prefer to have our engineering department examine and check all requirements before entering an order. By this careful and strict attention to all orders, we expect to keep up the quality of our product beyond the reach of competitors.

SERI-VANE FANS AND BLOWERS:



It is a well-known and accepted fact that the many blade fans are far superior and efficient to the old type paddle wheel fans. It was only after extended and thorough investigations and tests that we placed our well known SERI-VANE FANS on the market. By a scientific construction of not only the fan wheel but the housing also, we have been able to market a product so superior to the others that the results obtained are conceded to be little short of phenomenal.

Our Catalog No. 70 gives a complete description of this type of fans with certain valuable tables and engineering information. All our fans are constructed throughout of the best material obtainable and, size for size, are the heaviest fan on the market. We would not cheapen the fan by using lighter material to reduce the selling price.

PEERLESS WASHERS AIR AND **HUMIDIFIERS:**

We make the plain air washers as used in the ordinary ventilation system for Schools, Churches, etc., but also the more complex washers, humidifiers and de-humidifiers that are used in so many industries, as the manufacturing of Sausage, Gun Powders, Rubber, Soap, 645 Leather, Textiles, etc.

We can offer valuable suggestions and remedies for each manufacturing problem that may arise. The saving and economy effected is always greater than the first

We make fans, blowers and other allied products for any use where air is handled such as Heating and Ventilation, Forced and Induced Draft, Gas and Forge Blowers, Waste Heat Drying, Shaving and Blow Pipe work, etc.

For each particular subject we have prepared an invaluable treatise which will be sent upon request.

Our Engineering Department is ready at all times to offer suggestions and prepare plans and specifications illustrating fully their solution of any problem at

Please communicate with our nearest office for immediate attention.

GUARANTEE:

We guarantee the product of our manufacture for five years from date shipped; all claims of any kind and description are cheerfully rectified without any quibbling. The customer must be satisfied.

CLARAGE FAN COMPANY

MAIN OFFICE AND WORKS: KALAMAZOO, MICHIGAN

BRANCHES AND AGENCIES

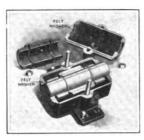
NEW YORK., N. Y., 149 Broadway
BOSTON, MASS., 120 Milk Street
BALTIMORR, MD., Light Street and Key Highway
CLEVELAND, OHIO, 511 Meriam Building
St. LOUIS, MO., 2211 Olive Street
TORONTO. CANADA, 1409 Royal Bank Building

DETROIT, MICH., 69 Buhl Block INDIANAPOLIS, IND., 821 Hume-Mansur Building CHICAGO, I.L., 111 West Washington Street MINNEAPOLIS, MINN., 305 Metropolitan Bank Bldg ROCHESTER, N. Y., 437 Mercantile Building

CLARAGE STANDARD BEARINGS:

In any centrifugal machine the point of greatest wear occurs in the bearings. For this reason all Clarage Fan Apparatus

is equipped with bearings especially protected against wear. Notice felt washers fitting snugly around shaft at each end of bearing



case. These are the protection—they keep dirt out and oil in. Standard Bearings are self-oiling, and self-aligning in all directions. S.K.F. ball bearings if desired.

REVERSIBLE AND ADJUSTABLE FEATURES:

All Clarage Fans and Blowers, in the smaller sizes with exception of $\frac{3}{4}$ housed fans and Special Pressure Blowers, are reversible and adjustable for 16 different directions of discharge.

CLARAGE MULTIBLADE FANS:

For heating and ventilating installations these fans are unusually efficient and operate quietly. Built sufficiently strong for 5 in.



pressure, water gage. Made single and double inlet, single width; and double inlet, double width.

Sizes Nos. 34 to 8, inc., numbers also indicate approximate diameter of wheel in feet. Capacities up to 201,000 cu. ft. of air per minute.



These fans are also used for removing smoke, dust or noxious gases. Can be motor, engine or turbine driven by belt or direct connected.

CLARAGE STEEL PLATE FANS:

Built primarily for mechanical draft work, although adapted for any work

where volumes of air are handled at pressures not exceeding 6 in. For induced draft special construction is necessary; fan housings are heavier and wheel is overhung. Bearing next to fan is water-



jacketed so that it will keep cool. Made $\frac{1}{2}$ or full housed in sizes Nos. 25 to 300, single or double inlet. Motor, engine or turbine driven, by belt or direct connected.

CLARAGE EXHAUST FANS:

Standard "SP" Exhausters are built very heavy and rugged. Used for elevating and conveying sawdust, shavings, and blocks in lumber mills; dust and lint from



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CLARAGE FAN COMPANY

polishing and emery wheels; cotton, wool or grain; smoke and vapors. Particularly suitable, however, where heavy materials pass through fan, due to strength and rigidity of construction. Built in sizes Nos. 25 to 160, single and double. Belt or direct motor driven.

Style "C" Exhausters have high effi-

ciency, Multiblade wheels, which run at lower speeds and save power. Used anywhere when materials do not pass



directly through fan. Sizes Nos. 30 to 60. Belt or direct motor driven.

CLARAGE PRESSURE BLOWERS:



Style "C" Pressure Blowers are suited for operation at moderately high speeds and against pressures up to 12 ozs. water gage. Multiblade wheels with peculiarly shaped blades make Style

"C" Blowers exceedingly efficient. Adapted for oil furnaces, foundry cupolas and forges. Sizes Nos. 30 to 60. Belt or direct motor driven.

Special Pressure Blowers are designed for work against high pressures (8 to 30 oz.) and for direct connection to standard speed



electric motors. First cost is about 1/3 of rotary blower; maintenance cost is negligible; and satisfactory performance guaranteed.

CLARAGE VERTICAL, SELF OILING STEAM ENGINES:

Fully enclosed. Adapted for direct connection to fans, blowers, pumps, motor generators, etc. Built in four classes to operate on steam pressures 10 to 250 lbs. and develop up to 40 H. P.



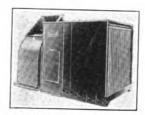
CLARAGE-SPRACO AIR WASHERS:

The bronze, center-jet nozzle in these air washers, is simple in design, yet produces a spray entirely different and superior to other types of nozzles. On account of special nozzles air is handled at maximum velocity on 720 ft. per min. Velocity is higher than usual practice and results in a more compact apparatus than otherwise possible. Sizes 2,800 to 103,000 cu. ft. of air per min.

647

OTHER CLARAGE PRODUCTS:

In connection with our fans we also furnish Vento and Pipe Coil Heaters, Engines, Motors or any accessories necessary or desirable for complete fan or blower installations.



Charge Multiple Fan and Pipe Coil Heater CO-OPERATIVE SERVICE:

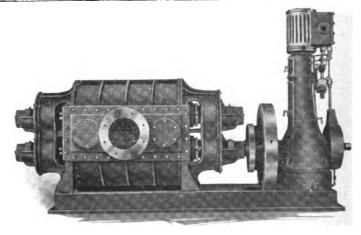
The Engineering Department of this company has compiled elaborate data covering capacities, etc., for every Clarage product. The department will gladly co-operate with engineers in every way possible. This material will be of value in determining requirements. The department will gladly co-operate with engineers in every way possible.

WILBRAHAM-GREEN BLOWER CO.

Established 1854

POTTSTOWN, PA.

Sole Manufacturers of Green Patented Rotary Positive Pressure Blowers, Gas Exhausters and Huntoon Patented Gas Governors



No. 7 Gas Exhauster with 7 x 8 Troy Enclosed Vertical Engine

648

Our products are known to the trade as "THE OLD RELIABLE."

ROTARY POSITIVE PRESSURE BLOWER:

Made in 18 standard sizes up to 18,000 cu. ft. of free air per minute and up to 5 lbs. pressure. Larger sizes built to order. Send for Bulletin No. 11.

ROTARY POSITIVE PRESSURE GAS EXHAUSTER:

Modern design equipped with ring oiling bearings and stuffing boxes that will not leak. Are built in 19 standard sizes up to 17,000 cu. ft. of free air per minute. Larger sizes built to order. Send for Bulletin No. 12.

ROTARY POSITIVE PRESSURE SMELTER BLOWER:

For smelter work let us give you facts and figures on our present two impeller type smelter blower. Made in 10 standard sizes up to 19,000 cu. ft. of free air per minute and up to 40 oz. pressure. Larger sizes built to order. Send for Bulletin No. 13.

CYCLOIDAL VACUUM PUMPS:

For flat suction boxes. Built for a steady high vacuum and a long life. Made in 11 standard sizes up to 700 cu. ft. of free air per minute. Send for Bulletin No. 15.

ROTARY POSITIVE PRESSURE BLOWER:

The most modern way to aerate raw water in ice plants, etc. Equipped with belt, reduction gearing or noiseless chain drive. Made in 9 standard sizes up to 600 cu. ft. of free air per minute at 3 lbs. Is strong enough for 5 lbs. pressure. Larger sizes built to order. Send for Bulletin No. 16.



Motor Driven Blower

Regular Foundry Blowers both **M**otor and Pulley Driven a specialty.
Built in all sizes.

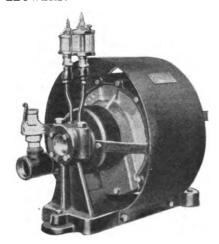
If you desire to deliver air or gas against pressures from 1 to 5 lbs. for any purpose whatever, we believe it will be to your advantage to allow us to quote you.

CRESCENT SALES & ENGINEERING CO.

DETROIT, MICH.

Distributors for Crescent Pump Co., Manufacturers of Vacuum Pumps, Pressure Blowers, Vacuum Chucks

CRESCENT "ROTO-PISTON" VACUUM PUMPS, PRESSURE BLOWERS:



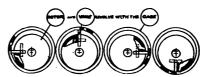
High duty, direct driven, high speed imps, with guaranteed long life. Vacuum pumps are guaranteed to pull to $\frac{1}{2}$ of the barometer or, for special uses, to $\frac{1}{10}$, or better. Pressure pumps give 15 lbs. per square inch. These are under commercial conditions.

Crescent "Roto-Piston" performance is based on an entirely original application of motions, giving positive displacement with rotary motion and eliminating valves, flying vanes and gears. The motion is completely balanced, opens and closes its own ports and gives self air-cooling.

In material and construction they are quality products, saving in weight, size, power and upkeep.

"ROTO-PISTON" CONSTRUCTION AND OPERATION:

Rotor and Vane revolve with case and at the same angular speed but on separate axis. The motion, however, is completely balanced with slight vibration even at the highest speeds. The vane, moving through the fixed crescent shaped space displaces as positively as in a reciprocating pump but uses a circular path. The action is continuous.



The Vane, sliding in the Rotor, moves in a straight line along a small flattened area of the Case periphery, a few inches with each revolution. All other contacts are rolling. Wear on bearings, vane and heads is automatically compensated.

Friction is reduced to a minimum.

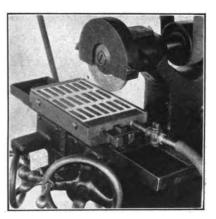
CRESCENT VACUUM CHUCKS:

For non-magnetic material, as well as magnetic material or light, delicate work, Crescent Vacuum Chucks are specially adapted.

The chuck is a hollow cast-iron body with lugs for bolting to the machine table. A series of tiny holes are drilled through the top plate. A thin gasket of any soft paper prevents leakage between chuck and work. A piece of paper is laid over holes not used.

The gasket may be eliminated for final accurate grinding.

It is adapted for use with the Crescent Vacuum Pump.



We will gladly explain more fully the construction and operation that make possible Crescent performance.

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LAMMERT & MANN CO.

Engineers and Machinists

WOOD AND WALNUT STS., CHICAGO, ILL.

Lammert Rotary Dry Vacuum Pumps and Pressure Blowers

LAMMERT VACUUM PUMPS:

Pistonless Valveless Rotary:

Made in a variety of types and sizes to meet the numerous dry vacuum requirements and also adapted to pressure work up to 20 pounds.

Types and Sizes:

650

Lammert pumps may be had air or water-cooled, belt driven or equipped with reduction gears and connected direct to motor. The air-cooled pumps are for intermittent service and will develop a 27-inch vacuum at sea-level. Size numbers 1-2-3-4, with capacities of 3½, 7, 14 and 24½ cu. ft. of free air per minute, respectively. This type is



Air-Cooled Pump for Intermittent Service

equipped with the capillary system of oiling and will operate for a week without refilling the oil cups.

The water-cooled pumps for continuous service will easily maintain a 28-inch vacuum at sea level and are made in sizes ranging from 1 to 10 inclusive, with capacities from $3\frac{1}{2}$ cu. ft. to 700 cu. ft. of free air per minute.

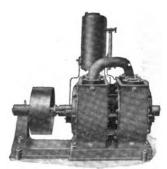
These pumps arranged in tandem for high duty are guaranteed to maintain a vacuum within $\frac{1}{2}$ inch of the barometer and are tested to as high as $\frac{1}{10}$ inch of the barometer. The larger water-cooled pumps are equipped with automatic



oiling and oil reclaiming system which cuts the operating attention to the absolute minimum. This system may also be applied to the small pumps.

Uses:

Lammert Vacuum Pumps—Used for canning, preserving, milking, in chemical laboratories and for many varied special purposes where high dry vacuum is desired. Also adapted to the priming of centrifugal pumps to which we attach our automatic control. Lammert Pressure Pumps—Used for agitating liquids, cleaning generators, blowers for machine shops or any service where pressure up to 20 pounds can be used.



Water-Cooled Pump, Tandem Type for High Duty Continuous Service

Advantages:

Lammert Pumps are simple, compact and operate without noise or vibration. There are no valves, cranks or connecting rods to wear or give trouble. All parts are standard and interchangeable and each part is rigidly inspected and every pump is tested to its full rated capacity.

Every Lammert pump carries a full guarantee against faulty material or workmanship.

We have been making vacuum pumps for 20 years and some of the largest concerns in America and abroad are using them with absolute satisfaction. Some of our first pumps are in daily operation without repairs.

Send for catalog of full particulars.



THE ALDRICH PUMP COMPANY

MAIN OFFICE AND WORKS: ALLENTOWN, PENNA.

New York

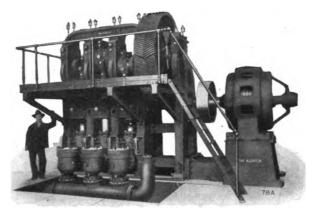
PHILADELPHIA

CHICAGO

PITTSBURGH

EL PASO

Manufacturers of Triplex and Quintuplex Power Pumps, Hydraulic Presses, Accumulators, Intensifiers, Alleviators, Etc.



Cut illustrates a type of Triplex Pump suitable for high pressure work or deep, mine pumping

We build **Pumps** for almost every purpose in a wide range of sizes and for any form of drive.



Hydraulic Presses for forcing, forming, drawing, forging, etc., built to exact requirements.



Fixed Cylinder Type Hydraulic Accumulators for cast iron, concrete, iron ore or punchings ballast. Also Hydro-Pneumatic. A complete line of standard sizes.

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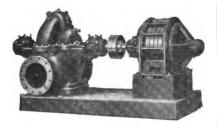
A. S. CAMERON STEAM PUMP WORKS

11 BROADWAY, NEW YORK

"OFFICES THE WORLD OVER"

Designers and Builders of Centrifugal Pumps; Piston and Plunger Simplex Steam Pumps for all Classes of Service

CAMERON DOUBLE SUCTION VOLUTE PUMP:



Double Suction Volute Pumps (Types DV and FV) are adapted to drive by electric motor, steam turbine or by other forms of power either by direct coupling or belting. DV Pumps are constructed for general service with capacities from 75 to 21000 G. P. M. for heads from 10 to 200 feet. These pumps are of the horizontal, split case type providing instant accessibility to working parts. All parts are manufactured of the best materials, carefully machined and rigidly inspected. All pumps are given a full load running test before leaving the works.

Bulletin 7250.

CAMERON MULTISTAGE TURBINE PUMP:

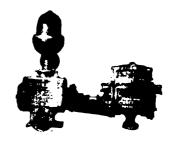


Multistage Turbine Centrifugal Pumps are available up to five stages in a single frame. A greater number of stages can be obtained by installing the pumps in series. Cameron quality and durability are in evidence throughout this entire line.

Kingsbury Thrust bearings or special internal hydraulic balancing devices are utilized to take up thrust. Capacities 75 to 2500 G. P. M. for heads 120 to 1500 feet. Adaptable to steam turbine or other power drive.

Bulletin 7351.

CAMERON REGULAR PATTERN PISTON PUMPS:



For general service, when a direct acting pump can be used, the Cameron is unbeatable for rugged construction and long efficient service. Numerous instances are brought to notice of Cameron Direct acting pumps, 50 years in service and "still going strong." Cameron Steam Pumps are essentially simple with very few parts and nothing to get out of order.

Bulletin 7204.



Cameron Pumps are built to give lasting satisfaction to the user.

M. T. DAVIDSON COMPANY

Works: 43-53 Keap Street, BROOKLYN, NEW YORK MAIN SALES OFFICE: 154 NASSAU STREET, NEW YORK

BOSTON: 30 Oliver St. WASHINGTON: Comm. Nat'l Bank. Bldg.

PHILADELPHIA: 147 N. 7th St. Rochester: Granite Bldg.

Manufacturers of "Davidson" Economical High Grade Simplex Pumps





SPECIFICATIONS OF "DAVIDSON" PUMPS Boiler Feed Pumps

Steam Cylinder	Water Cylinder	Stroke Inches	Gallons per Stroke	Boiler H. P. Pump Will Supply	Steam Pipe	Exhaust Pipe	Suction Pipe	Dis- charge Pipe
5	31/4	8	. 28	125	1/2	3/4	2	11/2
. 6	4	8	. 435	175	3/4	1	21/2	2
6	4	10	. 54	225	34	1	21/2	2
71/2	5	10	.85	350	34	1	3	21/2
8	51/4	12	1.12	500	1	11/4	3	21/2
9	6	12	1.47	600	1	11/4	4	3
10	7	12	2.00	875	1	11/2	5	4
12	81/4	12	2.77	1,150	11/2	2	6	5
12	81/4	14	3.23	1,400	11/2	2	6	5
14	81/4 81/4 91/4	16	4.66	2,000	11/2	2	7	6
14	10 •	16	5.44	2,350	112	2	8	1 7
16	101/2	l 18	6.74	3,000	2	21/2	l 8	1 7

Automatic Pumps and Receivers
Capacities of pumps given below are based on condensation of ½ lb. of steam per square foot per hour

Steam Cylinder	Water Cylinder	Stroke Inches	Sq. Ft. Rad. Sur. Pump Will Drain	Steam to Pump	Discharge from Pump
3	2	4	2,500	1/4	1
31/2	2¼ 2½	4	3,500 7,000	3/8	1 11/
41/2	3	6	10,000	1/2	11/2
5	31/4	8	15,000	15	11/2
6	4	10	23,000 30,000	% <u>1</u> 3/	2
71/2	5	iŏ	45,000	34	21/2
8	51/4	12	55,000	1	214

Vacuum Pumps

Steam Cylinder	Air Cyl- inder	Stroke Inches	Steam Pipe	Exhaust Pipe	Suction Pipe	Discharge Pipe	Floor Space Required	Sq. Ft. Surface in Vac. Heating Sys. Pump Will Care for	
314 314 4 414 414 5 5 6 6	4 4 5 6 6 7 7 8 8	4 6 6 8 8 10 10 12 12	**************************************	1 1 1 1	1 ½ 2 2 2 ½ 3 ½ 3 ½ 3 ½ 3 ½ 3 ½ 4	1½ 2 2 2½ 3 3½ 3½ 3½ 3½ 4	rint Plan, Giving Sions, Furnished Application	1,600 2,500 3,750 5,000 6,500 9,500 12,000 16,000 20,000 25,000	
7 8	10	12 12	134	1 11/4	4 5	4 5	e Fr men on	25,000 30,000	
.9	12	12	i	11/4	5	5	Dig	40,000	
10	14	14	<u> </u>	1 1 1/2	6	1 6		60,000	

Dry vacuum service pumps furnished with water seal on vacuum cylinder stuffing box.

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DAYTON-DOWD COMPANY

MAIN OFFICE AND WORKS: QUINCY, ILLINOIS
BRANCHES

90 West Street, NEW YORK 30 N 1304 Pennsylvania Bldg., Philadelphia, Pa. 219 Box 1692, Richmond, Va. 715 : 2211 Olive Street, St. Louis, Mo.

30 No. Michigan Blvd., CHICAGO, ILL. 219 Hurt Building, ATLANTA, GA 715 Schofield Bldg., CLEVELAND, O.

DAYTON-DOWD DOUBLE-SUCTION CENTRIFUGAL PUMPS, SINGLE-STAGE:



Type CS pumps are built in sizes from 1½" to 36" discharge for all classes of pumping service. We make a specialty of large pumps for irrigation and drainage. The casings are divided horizontally—and pumps bronze fitted—parts interchangeable. A high grade efficient pumping unit. Ask for bulletin No. 240-E.



DAYTON-DOWD APPROVED UNDER-WRITERS' CENTRIFUGAL FIRE PUMPS:

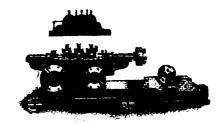


Type CSU centrifugal fire pumps are approved by all Fire Underwriters' Associations—built to meet their specifications. Sizes 500 Gallon—750 Gallon—1000 Gallon and 1500 Gallon. A large number of installations prove their popularity for fire protection. Estimates furnished on complete installations. Bulletin 243-E.

DAYTON-DOWD SINGLE-SUCTION AUTOMATICALLY BALANCED MULTI-STAGE PUMPS:



For all high pressure pumping service, the type CSU as specified. A thoroughly reliable and efficient unit. Axial thrust is controlled by means of disc balancing device, automatic in operation. Unexcelled for boiler feeding, mine station, elevator and other high pressure pumping service. Modern design and mechanical excellence both checked by running tests assure a dependable pump. Ask for bulletin No. 242-E.



TYPE SS SINGLE-SUCTION, SINGLE-STAGE PUMPS:

This type is furnished in sizes from ¾" to 6" discharge. Equipped with open type impeller for heads not exceeding 120 ft.

ENGINEERING SERVICE:

An experience of 20 years in solving pumping problems is at your disposal for working out pumps to meet your requirements. Tell us your requirements.

THE DEMING COMPANY

SALEM, OHIO, U. S. A.

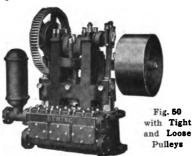
NEW YORK OFFICE AND STOCK: 152 Chambers Street Distributing Houses in All Principal Cities

Manufacturers of Hand and Power Pumps for All Uses

DEMING POWER PUMPS:

DEMING Power Pumps are made in such a variety of styles and sizes that their range of application is practically unlimited where belts, water wheels, electric motors, or steam, gas or gasoline engines are available sources of power. The types include Single- and Double-Acting Triplex Pumps for various services, Deep Well Power Working Heads, Artesian Well Cylinders, Rotary and Centrifugal Pumps. They are all built upon such lines as to insure great durability, efficiency, reliability, ease of operation and low cost of maintenance.

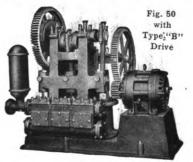
Deming Single-Acting Triplex Plunger Pump:



Size 7 x 8 to 81/2 x 8

Fig. 50 (illustrated), Single-Acting Triplex Pump, is designed for water works, hydraulic elevator service, boiler feed, pulp grinders and general water supply.

Deming Triplex Pumps embody the principle of the three-throw crankshaft. with the crank pins at an angle of 120 degrees with each other, by which ar-



Size 51/2 x 8

rangement the strokes follow and over- 655 lap one another. This results in a continuous and uniform action upon the fluid being pumped, and insures an easy flow through the delivery pipe, with a corresponding high degree of efficiency in the operation of the pump.

All of our triplex pumps, whether of low service, medium or heavy pressure types, have the plungers with crossheads outside guided, thereby relieving the stuffing-box glands of lateral pressure due to the side thrust of the connecting

Individual Bulletins of Deming Power Pumps Will Be Mailed to Engineers on Application.

FIG. 50. STANDARD SIZES, CAPACITIES, ETC.

PLUN	GERS		ing bs.	DIAM.	PIPES	PLUN	GERS		king Lbs.	DIAM.O	PIPES
Diam. In.	Stroke In.	CAPACITY Gallons Per Hr.	Max. Worki Pressure, L	Suction In.	Discharge In.	Diam. In.	Stroke In.	CAPACITY Gallons Per Hr.	Max. Work Pressure, L	Suction In.	Discharge In.
2 1/2 1/	2 2 3 3 3 4 4 6 6 6 8	340 532 684 972 1320 1800 2340 3540 4440 5460 8840	150 150 150 150 150 150 150 160 160 150 150	1 1/2 1 1/2 2 2 2 1/2 2 1/2 2 1/2 3 3	1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2	6 7 8 8 9 10 11 12 12 13	8 8 8 10 10 12 12 14 14	9660 13400 17240 19460 24800 27600 37400 44400 49200 58000	140 150 150 140 160 150 160 150 150 140	4 5 5 6 8 8 10 10 12 12	3 4 4 5 6 6 8 8 10

THE GOULDS MANUFACTURING COMPANY

MAIN OFFICE AND WORKS

SENECA FALLS, NEW YORK

NEW YORK 16 Murray St. PHILADELPHIA 111 North 3rd St. BOSTON 58 Pearl St. PITTSBURGH Oliver Bldg. CHICAGO 12-14 S. Clinton St. ATLANTA Citizens & Southern Bank Bldg. Houston 1001 Carter Bldg. DETROIT 804 Dime Bank Bldg.

Manufacturers of Pumps for Every Service

GOULDS PUMPS:

The Goulds Line includes hand and power pumps for every service. For 72 years Goulds Reliable Pumps have been generally recognized as the world's standard of quality. They are built to operate with the least possible power and all parts are made of the best material to give long, reliable service. They are rated conservatively, and when you get a Goulds Pump you can be absolutely sure that it will do just what we claim for it. Every Goulds Pump sold is guaranteed to give reliable, satisfactory service under the conditions for which it is recommended.

656

We have distributing houses and representatives in all principal cities, where stocks of pumps are carried from which prompt shipment can be made.

SERVICE:

The Goulds line includes types and capacities for all pumping services from water to tar and clay, and either acid, alkali or neutral.

It includes the small pump as well as the large pump delivering thousands of gallons per minute.

The Pumps can be furnished for belt, chain, gear or direct drive from all types of drivers.

ENGINEERING SERVICE:

Parties contemplating the installation of pumping equipment are invited to present their problems to this organization, which is prepared to assist in selecting the proper and most economical pump for their purposes.

Here follow a few points descriptive of a few of the pumps we make.

CENTRIFUGAL PUMPS:

Single Stage, Single Suction (Fig. 3000-3004) Open Impeller.

The Fig. 3000 Single Stage, Centrifugal

Pump, although extremely well adapted for general pumping service, is also well fitted for many special services. There are no valves to get out of order, and the pump is practically noiseless in operation.

The large open water passages of the Goulds Single Stage, Single Side Suction Centrifugal Pump adapt it particularly well for handling sewage and similar liquids. As a mine pump, it is well fitted, since the sand and grit, nearly always present in mine water, will not injure it. As a pump for irrigation, general water supply and booster service, Goulds Centrifugal Pumps excel on account of the high efficiencies which are obtained.

Figure 3004 illustrates the Goulds Single Stage, Single Side Suction Horizontal

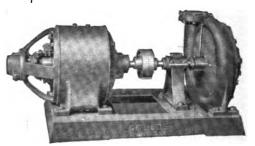


Figure 3004 Connected to Electric Motor

Shaft Centrifugal Pump direct connected to an electric motor. The pump and the motor are mounted upon an extended cast iron base plate, making the unit practically self-contained. The pump and the motor are direct connected by means of a suitable coupling of the flexible or rigid type, depending upon the conditions of service. It is built in sizes that range from 20 to 5000 gallons per minute capacity. Built in either right or left hand style.

THE GOULDS MANUFACTURING **COMPANY**

SINGLE STAGE, SINGLE SUCTION, ENCLOSED IMPELLER (Fig. 3600):

Goulds Fig. 3600 Horizontal Single Stage, Single Suction Enclosed Impeller Centrifugal Pump has not only high efficiency but is a moderately priced machine. It is a higher speed than the Fig. 3000 and 3004, and is designed especially for direct connection



Goulds Fig. 3600 Centrifugal

to electric motors.

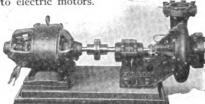
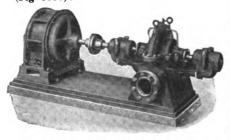


Fig. 3600 Connected to Electric Motor

The range of capacity and head can be accommodated at motor speeds readily obtainable in direct current, and alternating current of twenty-five, fifty and sixty cycles frequency. All main bearings are of the ring oiling type, sizes 5 and 6 having two rings. It will be noticed that the pump consists of but very few parts, and it has the utmost simplicity of design. In addition to cold water these pumps may be used for pumping clear liquids such as brine, gasoline, kerosene, light machine oils, etc.

SINGLE STAGE, DOUBLE SUCTION (Fig. 3030):



Goulds Fig. 3030 Double Suction Centrifugal Pump

Figure 3030-Single Stage, Double Suction Centrifugal Pump, direct connected to electric motor. This unit is adapted for general water supply.

For general water supply, hot water circulating in heating systems, for irrigating, booster or mine service, where the total net head does not exceed 150 feet, the Goulds Single Stage, Double Suction Centrifugal Pump excels on account of the high efficiency obtained. 50 to 8000 gallons per minute, based on cold clear water 150 ft. head or 65 lb. pressure. For all forms of drive.

CENTRIFUGAL SUMP PUMPS (Fig. 3013):

The Goulds Fig. 3013 Electric Sump or Bilge Pump is an automatic electric pump used to elevate to street sewers the drainage in buildings where the basement floors, boilers and elevator pits are below sewer level or for any other service where the liquid to be pumped accumulates in a catch basin, pit or tank.



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Fig. 3013 Centrifugal Sump Pump

CENTRIFUGAL FIRE PUMPS (Fig. 3014):

Used to discharge direct into hose lines or for service with automatic sprinkler systems.

The Goulds Centrifugal Pump has all of the characteristics that are the most desirable for fire protection service. The capacity is large for the floor space required, and the weight and first cost are low as compared with many other types of pumps; the construction is extremely simple and there is nothing to, get out of order and cause delay when the pump is needed; the pump is adapted for direct connection to electric motors, steam turbines or gasoline motors, and it maintains a steady pressure at the discharge.

Capacities from 500-1500 gallons per minute at 150 lb. pressure.

(Continued on next pages)

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(Continued from preceding pages)

THE GOULDS MANUFACTURING COMPANY

MULTI-STAGE HIGH LIFT CENTRIF-UGAL PUMPS (Fig. 3300):

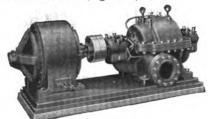


Fig. 3300

Fig. 3300 illustrates Goulds Multi-stage High Lift Centrifugal Pumps. These pumps are designed for direct connection to motor, turbine or engine both mounted on same base but can also be made for belt drive. These pumps are made to take the place of one or more single stage pumps and will operate against a maximum head of 250 lbs. or 580 feet. They range in capacity from 50 to 2000 gallons per minute.

Ask for bulletin No. 120.

TRIPLEX PLUNGER PUMPS SINGLE ACTING (Figs. 1157, 1648, 1672, 1696):

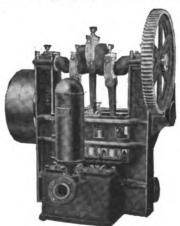


Fig. 1696

These pumps are designed on the same general lines throughout, but details of construction are varied somewhat for different working conditions and pressures, the latter ranging from 100 lbs. or 231 ft. elevation to 300 lbs. or 693 ft. elevation. Furnished for all forms of drive.

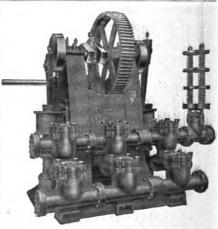


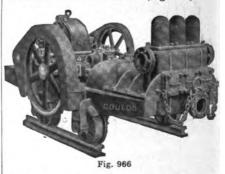
Fig. 1585

Fig. 1585 is a large capacity pump built in sizes covering a wide range of service, including general water supply, municipal waterworks, boiler feeding, hydraulic elevators, mine pumping, oil pipe lines, accumulators, hydraulic presses, etc. For 215 to 1,500 Pounds Working Pressure or 500 to 3,500 Feet Elevation. Other large capacity pumps shown in Goulds Bullet in No. 103 and 104.

DEEP WELL TYPE:

For 130 Pounds Working Pressure or 300 Feet Elevation. Capacities ranging from 5,400 gallons to 16,500 gallons per hour. For deep open wells, where the water is too low to be reached by suction from the surface.

PORTABLE MINE TYPE (Fig. 966):



This pump is of the horizontal, outside packed plunger type, and is designed especially for pumping mine sumps. It is

THE GOULDS MANUFACTURING COMPANY

made for any gauge of track, compactly and strongly built to take up as small a space as possible, consistent with good service. Three air chambers are used instead of one to reduce the height. Any make of moisture-proof motor can be fitted to this pump. For 130 Pounds Working Pressure or 300 Feet Elevation. Capacities from 50 to 300 gallons per minute.

DOUBLE ACTING PISTON VACUUM PUMPS:

Vertical, Horizontal, and Horizontal Duplex types. These pumps are designed for Suction-Box on Paper Machines, Vacuum Pans, Surface Condensers, and Vacuum system of Steam Heating. They have a displacement of 10,200 gallons to 162,000 (Duplex type) per hour. A special feature of the construction of the Horizontal types is that the waterways are so constructed that the valves at both ends of the cylinder are always submerged and the usual priming of the valves is not necessary.

SINGLE-ACTING TRIPLEX PLUNGER STUFF PUMPS:



For 43 and 65 Pounds Working Pressure or 100 to 150 Feet Elevation. Manufactured in three types, Nos. 1128, 1105 and 969 series with capacities ranging upward to 56 tons dry paper in 24 hours with Pumps 1128. Designed and built to stand constant hard work, pumping Wood Pulp and Stuff in Paper Mills and Pumping Size in Textile Mills.

BULLETINS:

The following bulletins, any of which will be sent on request, give complete specifications on the various standard types of Goulds Power Pumps.

- No. 100 Double-Acting, Single Cylinder Piston Pumps.
- No. 101 Single-Acting, Triplex Plunger Pumps, Outside-Guided Type.
- No. 103 Single-Acting, Triplex Plunger Pumps, Large Capacity and High Pressure Types.
- No. 104 Double-Acting, Triplex Piston Pumps, Vertical Type.
- No. 105 Single-Stage, Single Side Suction Centrifugal Pumps.
- No. 106 Vacuum and Stuff Pumps.
- No. 107 Deep Well Triplex Pumps.
- No. 108 Deep Well Working Heads and Cylinders. 659
- No. 109 Portable Mine Pumps.
- No. 110 Single-Stage, Double Suction Centrifugal Pumps.
- No. 111 Centrifugal Sump Pumps.
- No. 112 Handy Data on Power Pumping.
- No. 113 Power Rotary Pumps.
- No. 114 Vertical, Single-Stage Centrifugal Pumps.
- No. 115 Double-Acting, Triplex Plunger Pumps, Horizontal Type.
- No. 116 Single-Acting, Triplex Pressure Pumps.
- No. 118 Centrifugal Fire Pumps.
- No. 119 Single Stage, Single Suction Centrifugal Pumps, Enclosed Impeller Type.
- No. 120 Multi-Stage Centrifugal Pumps for General Service.
- No. 122 Centrifugal Pump Data.

Every Goulds pump is guaranteed to perform satisfactorily the specific work for which we recommend it.



LEA-COURTENAY COMPANY

7 MAINE ST., NEWARK, N. J.

TESTS:

NEW YORK PITTSBURGH Houston BALTIMORE

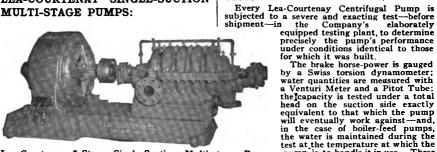
ATLANTA PURBLO DETROIT RICHMOND KANSAS CITY

CHICAGO CLEVELAND MINNEAPOLIS BIRMINGHAM

These

Designers and Manufacturers of Centrifugal Pumping Machinery

LEA-COURTENAY SINGLE-SUCTION MULTI-STAGE PUMPS:



Lea-Courtenay 5-Stage Single-Suction Multi-stage Pump Direct-Connected to Motor. Used for Boiler-Feeding Pur-poses in a Public Service Lighting Plant in Wisconsin. Pump,

a Venturi Meter and a Pitot Tube: the capacity is tested under a total head on the suction side exactly equivalent to that which the pump will eventually work against—and, in the case of boiler-feed pumps, the water is maintained during the test at the temperature at which the pumps; to handle it in use. These pump; is to handle it in use. These tests insure proved pump perform-

Built without diffusion vanes-designed to consume a minimum amount of power. Have well-defined volutes at each and every stage. Designed so that velocity head is transformed into pressure head insuring an extremely high efficiency. This feature and the hydraulic balancing feature of Uniflow Pumps are fully described in Bulletin H-4.

LEA-COURTENAY SINGLE-STAGE PUMPS (Known as **Double-Suction** Volute):

Designed with and without diffusion vanes. Main case consists of two parts only and is horizontally split. Suction and discharge are in the bottom half-the top half may be easily removed without disturbing the suction and discharge pipe connections. All parts are easily accessible. Pumps are bronze fitted throughout. Designed to work in almost perfect hydraulic balance and free from end thrust. See Bulletin H-4 for description.

ENGINEERING SERVICE:

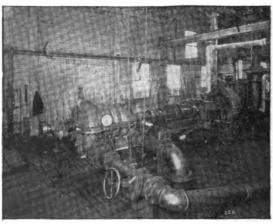
Lea-Courtenay Company maintains a corps of engineers whose expert services are available, without obligation, for the solution of pumping machinery problems and for the selection of pumps which will properly fulfill requirements.

for which it was built.

The brake horse-power is gauged by a Swiss torsion dynamometer; water quantities are measured with a Venturi Meter and a Pitot Tube;

ance-not guesswork or probabilities.

Write for Bulletin II-4 which fully describes Lea-Courtenay Double-Suction Single-Stage Pumps, Single-Suction Multi-Stage Pumps and Underwriters' Fire Pumps with motor, turbine and gas engine



General View of the Lea-Courtenay Testing Plant, Showing the Testing of an 8-Inch, 5-Stage All-bronze Pump.

MANISTEE IRON WORKS COMPANY

MANISTEE, MICHIGAN

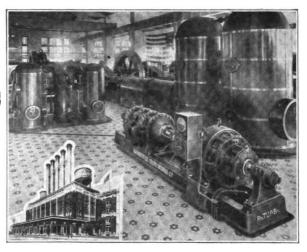
Manufacturers of Roturbo Centrifugal Pumps



Left-Roturbo Impeller Right-Flat Disc Impeller

The mostsalient feature of the ROTURBO CENTRIFUGAL PUMP is the Patent Pressure Chamber Impeller upon which are based several distinctive and unique features. The construcare based several distinctive and unique features. The construction of this impeller, which, instead of being a flat disc runner with the main object of securing velocity of the liquid which is afterwards converted into presented.

sure head in the diffusers or vol-ute, is designed in the form of a drum or pressure ute, is designed in the form of a diam of chamber, the object aimed at being to secure a constant pressure inside of the revolving impeller to the pressure required. The impeller having a large capacity, the water inside as it approaches the rim becomes practically stationary, relative to the impeller—thus eliminating frictional losses and wear and generating force directly.



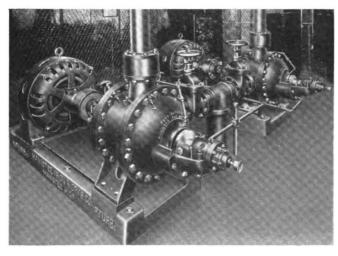
8-Stage Pump Boiler Feeder

In the rim of the impeller, there are arranged a series of turbine blades, which, owing to the extremely rearward direction in which they point, directs the course of the water so that it has a turbine effect upon the impeller; which increases as the volume increases. The result of this turbine effect is to transfer the power which would otherwise be absorbed by the driving mechanism to the rim of the impeller which makes a comparatively flat efficiency curve. Also an extremely flat brake horsepower curve, and a gradually drooping head and volume curve are obtained without arti-

ing head and volume curve are obtained without artificially "choking" the flow of water through the impeller.

A unique manner of directing the flow of water through the pump is used to place the shaft in hydraulic balance. This ac-complishes the purcomplishes the pur-pose perfectly with-out the use of "bal-ancing pistons" or "Ports" in the impeller; thus eliminating causes of trouble and furthering simplicity of construction.

Roturbo Pumps are made in all sizes, for all services, for any type of drive to suit existing con-ditions.



4-Stage Pumps Elevator Service (See page 175 for additional products of this Company)

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THE JOHN H. McGOWAN COMPANY

CINCINNATI, OHIO

Steam and Power Driven Duplex Pumps for All Uses

PRODUCTS:

Duplex Steam and Power Driven Pumps for all uses; Elevator and Water Works Pumping Engines: Electric Pumps furnished with all customary forms of drives in Mounted Motor and Extension Base Types.



INSPECTION:

The same rules of inspection inaugurated by the U. S. Shipping Board, Emergency Fleet Corporation in the production of pumps for the Emergency Fleet, is being con-tinued in the production of McGowan Duplex Steam and Power Driven Pumps for industrial use.

TRADE MARK

GUARANTEE:

All pumps are guaranteed to perform the service fог which they are recom-



mended and a g a i n s t

Fig. 33!—Center Packed Plunger
Boiler Feed and General Service Pump, size 6x4x6

any defects in either workmanship or material, arising during the term of the guarantee outlined in proposals.

SPECIFICATIONS:

Complete specifications covering detailed construction

will be furnished
with all proposals Fig. 440—Packed Piston
for special equip-Boller Feeder, size 3x2x3 ment and for standard steam and power driven pumps when requested.

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INSTALLATION DIAGRAMS:

All bulletins relating to McGowan duplex steam or power driven pumps have

the installation diagrams incorporated for the convenience of the buyer in planning their lo- Fig. 295 cation.



-Packed Piston Boiler ed and General Service Pump, size 6x4x6

STANDARDIZATION:

All McGowan Duplex Pumps are built on the interchangeable system through the use of modern Jigs and Templates, except with regard to the final fitting necessary

in the in stallation of large duplicate parts of Pumping Units, due the to variation castin ings, arising in usual foundry practise.



Fig. 430—Packed Piston Boiler Feed and General Service Pump size 14x8½x12

McGOWAN DUPLEX STEAM PUMPS: Bulletin 60

The valve plate design of duplex steam pump is built in the packed piston and outside center packed plunger patterns in all commercial sizes having fluid ends 81/2"x12" and smaller. They represent a high standard of pump construction, which insures a decided reduction in the cost of maintenance and improvement in pump service.

The special features ωf construction comprize (a)



A Fig. 282—Pot Valve Ram Pattern ead Oil Line or Heavy Pressure Pump, size 18x3x10 cross head of spool

form permitting rotating of pistons. (b) Renewable crosshead wipers on Rocker Arms. (c) Brass piston rod packing-box nuts fitted with swiveled glands. Threaded packing boxes screwed into the inner heads of pump cylinders which obviates the necessity of housing gaskets on the pump end. (e) Adjustable packed water

THE JOHN H. McGOWAN COMPANY

pistons, and (f) Brass bushed plunger packing box neck rings in all Center Packed Plunger Pumps, which construction obviates the necessity of reboring packing boxes when repairs to plungers become necessary. These pumps in

sizes 7½x5x 10 a n d smaller, smaller, are furnished in connection with Receivers for the Automatic return of condensation to boilers from heating and drying systems, engine jackets, cooking apparatus and for similar service.



Fig. 374—Packed Piston Boiler Feed and General Service Pump with Top Motor Mounting, size 4x6



Fig. 404—Packed Piston General Service Mine Pump with Side Motor Mounting, size 4x6

McGOWAN DUPLEX POWER PUMPS:



Fig. 383—Center Packed
The valve eval Service Pump with Tog
ate design of Motor Mounting, size 4x8 plate designof duplex power

pump is built in the packed piston and outside center packed plunger patterns. The sizes correspond to the pump ends used in the McGowan duplex steam pumps of the same design and are interchangeable

with them. They represent a line of commercial duplex power pumps adapted for all modern types of drives.

Sizes 5x6 and smaller are furnished in connection with receivers for the automatic re-turn of condensation to boilers, or general purpose pumping where automatic regulation is required.

SPECIAL SERVICE PUMPS:

These are built in either Vertical or Horizontal Packed Piston, Inside Packed, Outside Center Packed or Ram Patterns for all usual duties in connection with private industrial or Municipal Water Supply in combination

Compound and Triple Expans i o n Steam Ends. The arrangement of the steam cylinders in the Compound and Triple Expansion Types, is such as to permit access to and the removal of all steam pistons without disturbing any other part than the respective steam cylinder

heads.

with

Simple,



Fig. 225--Packed Piston or Inside Packed Plunger General Service Pump, size 16x12x12

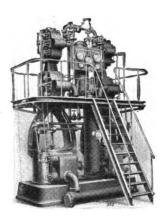


Fig. 322—Triple Expansion Steam End for Use in Combination with Vertical Type of Pump Ends

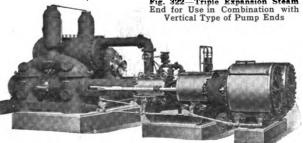


Fig. 362—Horizontal Triple Expansion Pumping Engine, Semi-Corliss Condensing Type: Built with Packed Priston, Inside Packed, Center or End Packed Plunger Types of Pump End

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MORRIS MACHINE WORKS

BALDWINSVILLE, N. Y.

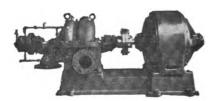
Branch Offices in Principal Cities

Builders of Centrifugal Pumping Machinery, Hydraulic Dredges, Stationary and Marine Engines

We build CENTRIFUGAL PUMPS for almost any service and of all types including side suction and double suction, vertical or horizontal shaft. STAGE PUMPS for high heads. TWIN PUMPS for large capacities and high speeds. Or will design SPECIAL PUMPS to suit special conditions. As the oldest and largest firm in the country building exclusively this class of machinery, our experience of over fifty years has covered all services for which Centrifugal Pumps have been used.

MORRIS CENTRIFUGAL PUMPS:

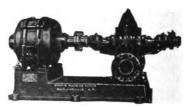
Are perfectly balanced, require small space and foundation; have high efficiency; are equally suitable for from small up to very large capacities, and can handle sand or solids with the water without injury. These pumps direct connected to reciprocating engines are suitable for moderate heads, or direct connected to electric motor or steam turbine (or belt driven) for high heads. For heads above 100 feet, pumps are preferably built in stages.



Horizontally Split Multi-Stage Pump

The SINGLE- and MULTI-STAGE horizontally split pumps, illustrated, are built to meet the demand for a pump capable of high speed and efficiency. We build them from 2" up to 20" discharge. They are bronze fitted and where pump-

ing acids the entire water end is made of acid-resisting bronze. This type is used by the Navy Department.



Horizontally Split Single-Stage Pump

Arranged for belt, motor or turbine drive as desired.

DREDGING PUMPS:

Morris Dredging Pumps are made in sizes from 2" discharge and upward, built of cast iron, carbon or manganese steel, both lined and unlined. They are belt driven or direct connected to steam engines. For the sake of economy 15-inch and larger dredging pumps are usually directly connected to compound or triple expansion steam engines. We have also many dredging pumps in service directly connected to electric motors. We can furnish pumps only or the complete dredge, including all machinery.

STEAM ENGINES:

We also build a complete line of STATIONARY and MARINE ENGINES, in single cylinder, compound and triple expansion types from 1½ up to 1000 H. P.



Write for complete catalog today.

MORRIS MACHINE WORKS

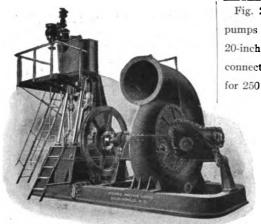
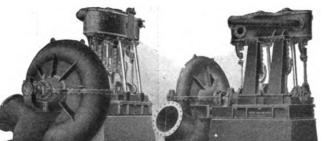


Fig. 1

Fig. 2 shows a set of large circulating pumps for surface condensers. They are 20-inch All Composition Pumps, directly connected to Compound Engines. Built for 250 pounds steam pressure.

Fig. 3 shows a large triple expansion [marine engine of 800 H. P.



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Fig. 2

At present we are making a specialty of circulating pumps for surface condensers, marine engines, as well as dry dock pumps.

Fig. 1 shows one unit of a large dry dock pumping system, which consists of three 36-inch directly connected Pumping Engines. Total average capacity, 115,000 gallons per minute. Total horse-power engines. 1050.

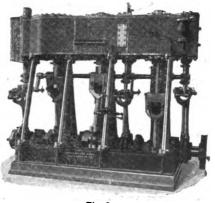


Fig. 3

NOVO ENGINE CO.

LANSING, MICH.

Manufacturers of Novo Gasoline and Kerosene Engines from 1½ to 15 H. P., Hoists, Force_Pumps, Diaphragm Pumps, Air Compressors, Saw Rigs, Etc.



THE NOVO ENGINE:

Is exceedingly simple and reliable in every way. They are built of the very best possible material for long and continuous service under the hardest of conditions. Novo Engines are frost-proof, simple in construction, with few working parts, and with practically nothing about them to get out of order. Practically anyone can operate the Novo Engine entirely satisfactorily.

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Fig. 255

Novo Engines are built in the following sizes: 1½, 2, 3, 4, 6, 8, 10 and 15 H. P. The 15 H. P. size is of the two-cylinder type.

NOVO HOISTS:

Are made in forty-four different sizes and types, all combinations, both single and double drum, one or two speeds, reversible or non-reversible. Novo Hoists are light in weight for the power developed. They are easily moved about and can be started and stopped as soon as the job is ready and completed so there is no waste of fuel. They take up very little space so can be used anywhere.

The Type DH Hoist shown in Fig. 217 shows the double drum, reversible hoist with 15 H. P. Engine.

The Novo Line also includes a variety of SAW RIGS especially built to stand the hard usage demanded of them on all

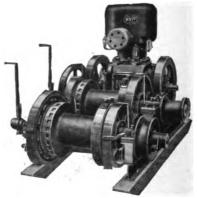


Fig. 217

construction jobs. They will save enough time to pay for themselves on one fairsized job.

Ask for our special bulletin on Saw Rigs.

We have illustrated here only a small part of the Novo Line. There are two hundred and fifty different sizes and types to choose from.

You should have our general catalog entitled "Reliable Power," containing description and full specifications of Novo Engines and Outfits.

NOVO ENGINE CO.

NOVO FORCE PUMPING OUTFITS:

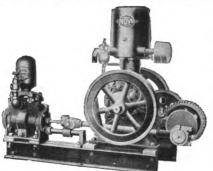


Fig. 14139

Will handle practically any work where a dependable water supply is required.

The Type U Outfit shown in Fig. 14139 is built for high pressure or long distance pumping. It is especially recommended for the job requiring water under pressure, two or three miles from the source of supply.

NOVO TRIPLEX PUMPING OUTFITS:

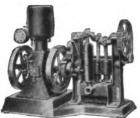


Fig. 1446

Illustrated in Fig. 1446 are also recommended for high pressure pumping where a steady pressure is necessary. The strokes of the three cylinders overlap, thus maintaining a uniform Built in any size up to 15 horse power.

NOVO DIAPHRAGM PUMPING **OUTFITS:**

Shown in Fig. 403 mounted on skids or hand trucks with one or two pumps as desired are exceedingly useful for draining excavations, trenches, etc., where muddy and gritty water has to be handled.

The Novo Outfits also include chaindriven and direct-connected centrifugal pumping outfits. They move large volumes of muddy or gritty water quickly.

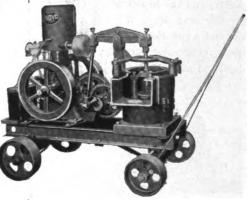
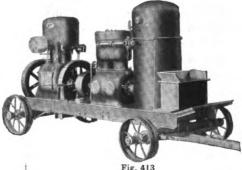


Fig. 403

NOVO AIR COMPRESSOR OUTFITS:

Shown in Fig. 413 with single cylinder compressor or double cylinder types, not illustrated, have capacities from 5 to 80 cu. ft. of free air per minute. Will operate all kinds of air tools perfectly satisfactorily.



Our book, "Reliable Power," gives full information on all Novo Engines and Yours for the asking.

Outfits.



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THE PRESCOTT COMPANY

MENOMINEE, MICHIGAN, U. S. A.

MINE

PRESCOTT MENOMINEE

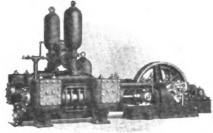
PUMPS

Electric Drive

The past five years have been, perhaps, as historical a time in the development of pumping machinery for mines as any so far in the life of this great industry, and the two outstanding reasons for this are: First, the ever-increasing use and adaptation of electricity in the mining fields; and, secondly, the greater depths to which shafts are being sunk.

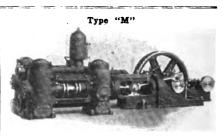
Type "C"

668



Built in Sizes up to 1000 G. P. M. and 500 Ft. Hds.

In the ordinary wet mine a greater variety of problems to pump builders is found than in any other place. Mining men have every condition to contend with known to pump manufacturers. All kinds of pumps are used, the entire field of low and high service is covered—water of every character is encountered and it is an extremely serious proposition in the case of the average mine to keep the pumps running continuously. It is a hard service and the best pumps money can buy are absolutely necessary.



Built in Sizes up to 5000 G. P. M. and 5000 Ft. Hds.

We design and build just such Electric Mine Pumps. They are of the horizontal duplex double acting type and are made in sizes for any capacity and any pressures. Large valve areas and water passages characterize all our different types. Friction losses are thus reduced to a minimum and pumps of the highest efficiency obtained.

The steady growth of our business and rapid extension of our lines render it impossible to show everything here that we make. The machines illustrated, however, will give those contemplating buying pumping machinery a fair idea of the nature of our product.

"Pot Form"



For Any Gallonage and Any Head

We would, therefore, appreciate it highly if prospective purchasers would write us relative to their individual problems and the purpose to be accomplished, and allow us to submit detailed information covering their requirements.

WARREN STEAM PUMP COMPANY

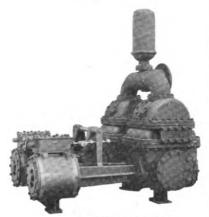
WARREN, MASS.

Manufacturers of Steam and Power Pumping Machinery

WARREN PUMPING MACHINERY:

The reputation which is enjoyed by this company for the excellence of its product is due not alone to careful designing but to a painstaking care in the machining and finishing of each individual pump. The high standard adopted by the company at its inception has been rigidly maintained and today the Warren Standard is recognized by a large and discriminating body of engineers as the basis for a just comparison where quality and efficiency are desired.

WARREN DUPLEX PUMPS:

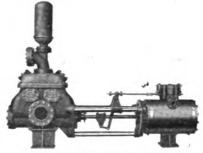


Size 16 x 14 x 12, Piston Pattern

Warren duplex pumps are made in a variety of types and sizes with both simple and compound steam ends and in common with all other classes of Warren pumps are of rugged construction, carefully designed and built so as to ensure permanency of alignment and give the maximum of efficiency and service at a minimum cost of upkeep. The pump illustrated above is of the double cap type of large valve area and suitable for handling heavy liquids such as crude oil. Pumps of this type can be furnished with or without separate suction and discharge valve plates.

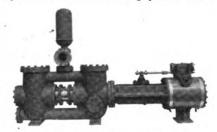
WARREN SINGLE PUMPS:

These are made in both the piston and plunger patterns for both light and heavy service. All pumps of this class are equipped with the patented Warren "Eclipse" valve gear. The dominant



Size 18 x 12 x 18, Piston Pattern

feature of this valve gear is the movement of the slide valve through mechanical action at the point in the stroke where the requirements for steam are not as great as at reversal. This action throttles the steam until the end of the stroke at which point the auxiliary valve operates the valve driving piston which



Size 18 x 10 x 18, Plunger Pattern

takes up and completes the movement of the valve. Through its use economy of steam consumption is combined with positiveness of operation and increased overall pump efficiency.

In addition to many other types of pumps we build Jet Condensers and Receiver Outfits for high and low pressures.

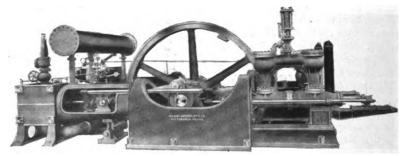
Blue Prints and Estimates Furnished.

WILSON-SNYDER MFG. CO.

General Office and Works

PITTSBURGH, PA.

Manufacturers of Steam Pumps, Centrifugal Pumps, Electric Pumps



PUMPING ENGINE FOR PIPE LINE SERVICE Normal capacity 20,000 barrels per day against 1000 lb. pressure.

WILSON-SNYDER PUMPS:

Rugged Readily Accessible Accurate Workmanship

Our standards are based on long stroke as the cardinal principle. So far as possible the interchangeable system of construction has been adopted. Bronze bushings and burrs, for example, are all interchangeable. We need hardly dwell on the immense advantage which this system offers. Instead of waiting, perhaps, weeks for the making of a trivial repair part, you have merely to telegraph or write to us for a new piece.

PARTIAL LIST OF WILSON-SNYDER PRODUCTS:

Accumulators

Automatic Steam Regulating Valve

Automatic Water Regulating Valve, for Pump Pit

Barge Pumps

Boiler Feed Pumps, all types

Cargo Pumps

Centrifugal Pumps
Large volumes, low heads

Medium volumes, high heads
Compound Duplex Pumps
Piston. Plunger. Condensing.

Piston, Plunger, Condensing, Non-Condensing, Hydraulic, Vertical and Horizontal

Direct Acting Pumps
Air, Boiler Feed, Mine, Piston,
Plunger, Tank or Light Service

Duplex Power Pumps, all services

Duplex Pumps, for all services

High Duty Pumping Engines
Horizontal Cross Compound
Hydraulic Compound Duplex Pumps
Hydraulic Crank and Flywheel Pumps
Independent Air Pumps and Jet Condensers

Direct Acting, Single

Jet Condensers

Line Pumps

Mine Pumps

Direct Acting, Duplex, Centrifugal

Piston Pumps

Direct Acting, Duplex

Pipe Line Pumps

Plunger Pumps

Compound and Duplex, Triple, Direct Acting

Power Pumps

Duplex, Triplex, Vertical and Horizontal

Regulating Balanced Valve for Accumulators

Regulating Valve for High Pressure Pumps

Steam Separators

Steam Valves for Direct Acting Pumps

Tank or Light Service Pumps Direct Acting, Duplex

Tar Pumps

Triple Expansion Pumps

Triplex Power Pumps for Hydraulic Service

Vacuum Pumps

Vertical Compound Duplex Pumps

Vertical Cross Compound Pumps

Vertical Triple Expansion Pumps

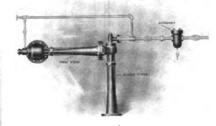
WORTHINGTON PUMP AND MACHINERY CORPORATION

MAIN OFFICE: 115 BROADWAY, NEW YORK

BLAKE-KNOWLES WORKS: EAST CAMBRIDGE, MASS. Branch Offices in All Principal Cities General and Special Service Pumps, Simplex Pumps, Marine Pumps, Sugar House Pumps, Power Plant Pumps, Fire Pumps, Oil Engines, Heaters, Etc., Etc.



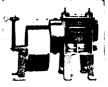
Style "A" Boiler Feed Pump



Two Stage Non-Condensing Steam Ejector



Steam Heating Vacuum Pump



Core Wire Straightener

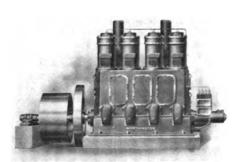
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Fuel Oil Pumping

System

Vertical Simplex Pump



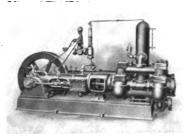
Solid Injection Oil Engine



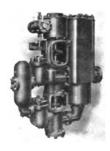
Vertical Simplex Pump



Twinpex Vacuum Pump



Duplex Fly Wheel Filter Press Pump



Locomotive Feed Water Heater



YEOMANS BROTHERS COMPANY

1426 DAYTON ST., CHICAGO

Representatives in Principal Cities

Manufacturers of Sewage Ejectors and Pumping Machinery; Municipal Sewage Pumping Plants

FORM "A" YEOMANS DUPLEX CENTRIFUGAL SEWAGE EJECTORS:

raising sewage and drainfrom deep age basements or lowsewers in hotels, office buildings, industrial plants, municipalities, sub-ways, real estate sub-divisions, etc. High grade equipments with suction type pumps operating in dry pit, direct connected to slow speed motors,



cast-iron receivers with large area, self-cleaning, cast-iron screen, high water alarm, automatic control, flush-back check 672 valves, force feed lubrication, ball thrust bearings, all parts easily accessible, no sedimentation or clogging. In use for many years in important buildings, U. S. Government stations and municipalities.

SEWAGE SHONE PNEUMATIC **EJECTORS:**



The oldest and most reliable device on the market for handling crude sewage in all classes of service. Automatic, sanitary and durable—requiring minimum attention, nominal maintenance cost. No screens, no storage chambers, no floats. Ejectors can be located under thoroughfares and operated from compressor plants at any desired distance from Ejectors. Either electric or steam compressors can be used, or compressed air from supply maintained in industrial plants for other purposes. Shone Ejectors have been in use for over thirty-five years in all parts of the world.

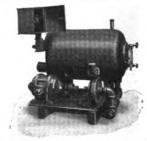
YEOMANS ELECTRIC BILGE OR SUMP PUMPS—SINGLE AND DUPLEX:

For raising drainage from deep basements, condenser pits, sub-ways, etc., built in two grades: Grade 1, slow speed pumps with force feed ball thrust bearings, oil immersed, submerged pump bearings, high water alarm, float enclosed in pipe casing, and other distinctive features; Grade 2, moderate speed equipments with



babbitt thrust bearings, exposed copper floats, without high water alarm; both grades extremely rugged in design and construction and built for most exacting

YEOMANS CONDENSATION RETURN PUMPS AND RECEIVERS:



For returning condensate to boilers in gravity heating systems. Receiver with direct connected pump and motor all mounted on one base, enclosed automatic control; positive and efficient. Type "H" (see cut) for return lines above floor level; Type "V" (similar to Bilge Pump) for return lines below floor level.

Single and Multi-Stage Yeomans Centrifugal Pumps for house supply and general service. Gravity or compression water supply systems for hotels, office buildings, etc.

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RODNEY HUNT MACHINE CO.

83 MILL STREET, ORANGE, MASS.

Manufacturers of Turbine Water Wheels, Water Controlling Apparatus, Power Transmission Equipment, Underwriter Rotary Fire Pumps, Wood Rolls, Textile Wet Finishing Machinery



TURBINE WATER WHEELS:





Hunt-McCormick and Hunt-Francis. Result of over 40 years' effort toward getting the greatest power with best speed and efficiency results. Complete accessory equipment.

WATER CONTROLLING APPARATUS:





for water power plants, power and storage dams, filtration and irrigation systems. Penstocks, flumes, etc. Relief valves and gauges. Gates and valves. Gate hoists and floor stands. A staff of trained engineers always at your service.

RAKES FOR TRASH RACKS AND SCREENS:

The best rake you can buy-hence the cheapest. Of pressed steel, un-



breakable, light-easy to handle-has extra deep basket. Handle stays in. End teeth guards practically eliminate interference with screen back hars

With RODNEY HUNT screens there is no interference. Price \$8; handles extra.

WE SPECIALIZE IN TEXTILE WET FINISHING MACHINES:





for dyeing, bleaching, rinsing, washing, scouring and fulling goods in the string of roll. Ask about our Type M Fulling Mill, Type MK combination scouring, fulling and finishing machines, also Washers and RODNEY HUNT Reel Machines. All have standardized, interchangeable parts instantly replaceable.

ROLLS FOR EVERY PURPOSE:

673



made entirely in our own factory from the best woods that grow, properly seasoned for

the particular work in view. Prompt shipment is one of the things you will like about HUNT roll service. Try us.

Roll Blueprint Specification Sheet:



Order Wood Rolls from RODNEY HUNT Roll Blueprint Sheets. Send for a set today.

SEE

ENGINEERING

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Send for Catalogs on:

TURBINE WATER WHEELS CONTROLLING APPA-WATER RATUS

RAKES AND SCREENS POWER TRANSMISSION EQUIPMENT UNDERWRITER ROTARY

FIRE PUMPS

TEXTILE WET FINISHING CHINERY WOOD ROLLS

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THE WM. CRAMP & SONS SHIP & ENGINE BUILDING CO.

RICHMOND & NORRIS STS., PHILADELPHIA, PA.

Manufacturers of I. P. Morris Hydraulic Turbines

TOTAL CAPACITY OF I. P. MORRIS TURBINES BUILT OR UNDER CONSTRUCTION 2,458,380 HORSE POWER

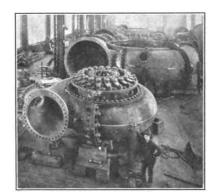
Some of our Typical Installations:



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THE NIAGARA FALLS POWER CO.:

Two 37500 H. P. Turbines have been installed for this Company in their Hydraulic Plant at Niagara Falls. Head-214 feet. Speed-150 R. P. M.



THE GREAT NORTHERN POWER CO.

Two 15,000 H. P. Turbines have been installed for this Company in their plant at Fon du Lac. Minn.

Head-355 feet.



THE MONTREAL LIGHT, HEAT & POWER CO.

Nine 10,800 H. P. Turbines have been installed for this Company in their plant at Cedar Rapids, P. Q.

Head-30 feet. Speed-55.6 R. P. M.



THE POWER HYDRO-ELECTRIC COMMISSION OF ONTARIO:

Two 12,500 H. P. Turbines have been built for the above Commission for their plant at Cameron Falls, Ontario.

Head-72 feet. Speed-120 R. P. M.

Three 55,000 H. P. Turbines (most powerful ever built) are under construction for the Niagara Development of the Hydro-Electric Power Commission of Ontario.

This Company is now building JOHNSON VALVES

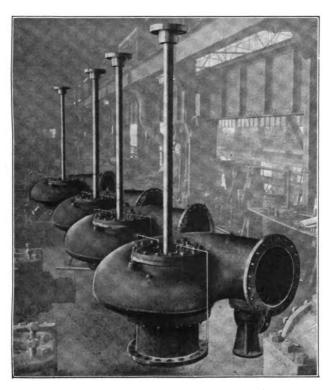
for the

Speed-375 R. P. M. | Larner Johnson Valve & Engineering Co.

THE WM. CRAMP & SONS SHIP & ENGINE BUILDING CO.

RICHMOND & NORRIS STS., PHILADELPHIA, PA.

Manufacturers of I. P. Morris Spiral Pumps, Moody Type



Four Vertical Pumps for Cramp's Graving Dock Capacity 12,000 g. p. m. each. Head 16.5 Ft. Speed 692 R. P. M.

The Spiral Pump is capable of discharging large quantities of water under low and medium heads and under these conditions will operate at double the speed of the usual centrifugal pump.

High Speed means cheaper motors, smaller and lighter pumps, and hence more compact equipment.

Among its many uses may be mentioned:

Floating Dry Docks Graving Docks Irrigation Reclamation

Sewage Disposal Drainage Water Supply Condensers Spiral Pumps now under construction in our shop:

Cramps Graving Dock 4-20" Pumps

Bethlehem Shipbuilding Corporation, Ltd. 20-15" Pumps

Ramberg Drydock & Repair Co., Inc.
4-20" Pumps

Send for our Spiral Pump Bulletin No. 5.

675

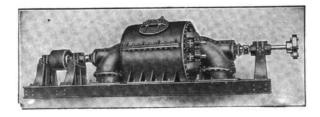


ENGINEERING

J. & W. JOLLY, INC.

HOLYOKE, MASS.

Manufacturers of McCormick Holyoke Turbines, Paper Mill Machinery, Cut Gears. Gray Iron Castings, General Machinery



McCORMICK HOLYOKE TURBINES:

We are prepared to furnish our standard and special wheels, either cylinder or swing gate, on horizontal or vertical shafts, complete with boiler iron flumes and all connections.

676

All our standard water wheel patterns have been tested in the official testing flume of the Holyoke Water Power Company and we guarantee at least 80% efficiency.

We also manufacture Headgates complete with operating mechanisms, of various designs, for gates opening either vertically or horizontally.

Having our own foundry, patternmakers and machine shop, we are in a position to make special machinery at any time.

Also Manufacturers of:

"White's" Patent Oscillating Screen

Rag Dusters

Rag Thrashers

Jordan Engines

Beating Engines

Stuff Pumps

Size Pumps

Elevators

Baling Presses





THE JAMES LEFFEL & CO.

SPRINGFIELD, OHIO, U. S. A.

Manufacturers of Turbine Water Wheels, Steam Engines and Boilers

LEFFEL TURBINE WATER WHEELS:



Fig. I. Vertical Turbine

Vertical Leffel Turbine Water Wheels: Equipped with latest type of Leffel steel bucket runners mounted on vertical steel shafts. The revolving parts of these turbines are carried on special design step bearings. The gate casings are fitted with balanced swing type gates, each gate removable separately and fitted with adjustable steel connections. The gates are operated with Leffel's latest type of gate equipment. The bearings are of special designs and large dimensions (Fig. 1).

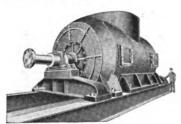


Fig. 2. Horizontal Turbine

Horizontal Leffel Turbines: Are built in various types and designs, single and double discharges. Frequently to suit requirements two or more turbines are built on one horizontal shaft, developing large horse power and high speeds, for direct connection to driven machinery. Some of these turbines are constructed with steel casings and others for open penstocks (Fig. 2).

Type "Z" Leffel Turbines: These turbines of special design for developing high speed, high horse power, high efficiencies, vertical and horizontal designs,

for direct connection to electric generators, milling machines, saws, grinders, pumps and other high speed machinery. These turbines are of the most modern and latest designs in all details.

Governors: This Company also furnishes governors for regulating the speed of the different designs and capacities of turbine water wheels. These governors are of the very latest types and designs throughout.

Guarantee: All of the work furnished by this company is fully guaranteed to be strictly first class throughout, of latest designs and of strong and substantial construction in all details.

Catalogs: Catalogs concerning these turbines furnished on application.

SPECIAL HYDRAULIC MACHINERY:

This Company also builds head gate hoisting machinery, steel piping; also all kinds of power connections, shafting, gearing, pulleys, bearings, bridge-trees and many other designs of hydraulic machinery.

LEFFEL ENGINES AND BOILERS:



Fig. 3. Leffel Engine and Internal Fired Boiler

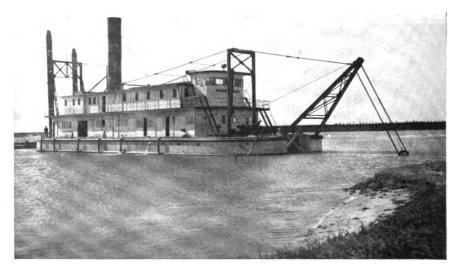
This Company also builds a line of Throttling and Automatic Steam Engines and Boilers, Horizontal and Vertical, from 3 H. P. up. Figure 3 shows one of the many styles. Complete illustrated Catalog with full information on request.

ELLICOTT MACHINE CORPORATION

Established 188

BALTIMORE, MD., U. S. A.

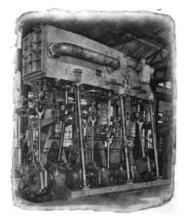
Designers and Manufacturers of Hydraulic Dredges, Marine Engines, Dredging Machinery, Sand and Gravel Machinery, Centrifugal Pumps, Pumping Engines



High Powered Pipe Line Dredge

Hydraulic Dredges are our specialty.

The dredge illustrated represents our latest type of high powered pipe line dredge. We build machines of this type up to a capacity of fifteen hundred cubic yards per hour, and capable of delivering through pipe lines exceeding two miles in length. The hydraulic dredge is most satisfactory for making and deeping waterways and stands in a class by itself as the only practicable machine for filling in and reclaiming land.



Marine Engines of the type illustrated represent the highest type of Modern Marine construction and design for steam reciprocating propelling engines.

Correspondence Solicited.

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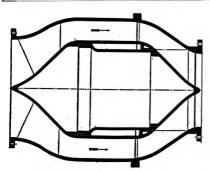
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THE LARNER-JOHNSON VALVE & ENGINEERING COMPANY

WIDENER BLDG.

PHILADELPHIA, PA.

Johnson Hydraulic Valves. Johnson Differential Surge Tanks



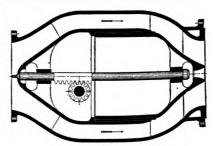
Type "A" Johnson Valve

TYPE "A" JOHNSON VALVES are designed especially to suit the requirements of water power plants. They are not intended for throttling.

They may be operated from a distance hydraulically or electrically, require no auxiliary power for operation, do not have to be by-passed and will close automatically in case of a break in the system beyond the valve. All parts are circular and, therefore, not subject to distortion under pressure. The plunger is ground to fit the seat and is absolutely tight when closed. No packing is used on the plunger and there are no delicate internal parts to wear or get out of order.

The plunger is operated by an external control valve which exhausts pressure from the internal chambers of the main valve and opens or closes the plunger. The control valve is operated locally by hand or from a distance by hydraulic or electric means. The control automatically cracks the plunger open slightly to prime the empty system before opening the valve wide and damps the end of the closing stroke to prevent water hammer under all conditions.

TYPE "C" JOHNSON VALVES are adapted to general use under high and



Type "C" Johnson Valve

low pressures. They are operated by hand or electrically.

This valve has an internal control valve operated by a rack and pinion and is so designed that the plunger moves with the control valve without transmitting any load to the control mechanism. The time of opening or closing may be varied at will by the operator and the plunger may be held with precision at partial openings. It is the ideal valve for throttling, being entirely free from vibration or erosion.

THE JOHNSON DISCHARGE REG-ULATOR is similar in design to the Type "C" Valve and is adapted particularly to so-called "free-discharge" conditions. This Regulator will discharge a jet into the air under any head without danger of vibration or erosion. It is built in all sizes to suit requirements and may be operated either by hand or electricity. It may be set for any position between open and closed and will not drift. It may be arranged by means of float switches to maintain automatically the level of a pond either above or below the Regulator.

The Johnson Discharge Regulator is the ideal device for reservoir outlets in connection with water works, irrigation projects and water power plants. 679

THE CHARLES BURROUGHS CO.

NEWARK, N. J.

Designers and Builders of Hydraulic Machinery for Any Service Pioneers and Patentees of Automatic Hydraulic Presses Tools, Jigs and Fixtures

OUR HYDRAULIC SPECIALTIES:

Rodless Hydraulic Presses (Patented):

This style of press we recommend as the most rigid and simplest ever constructed, there being no rods to stretch or nuts to work loose. Absolutely parallel surfaces are maintained between the platens.

We can furnish any size and number of platens and any power.

Hydraulic Rod Presses: We have been building them for the past forty years for many purposes. Their use being

Hydraulic Pumps: Plain Hand, High and Low Pressure Hand, Belt or Motor Driven, 2, 3, 4 and 6 plunger, with accumulator stop; automatic change high and low pressure; any combination to suit your requirements.

Hydraulic Accumulators: Weighted with cast weights, or scrap.

Variable Pressure.

We can always suit your requirements.

A Large Variety of Hydraulic Valves and Fittings. Special Steamplates.

Hydraulic Tools and Machine Tools (Mostly Patented): Extruding Machines, Dehydrating Presses, Special Moulding Presses, Sheeting, Planers, Hubbing Presses, Angle Moulding Presses, Semi-Automatic Moulding Presses, etc.

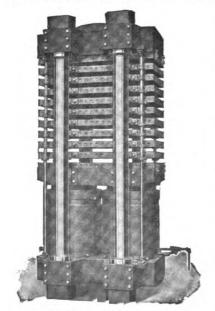
Moulds: Forty years ago we were the pioneer makers of Moulds for "Celluloid" articles. Since then we have made them for every conceivable article in practically all of the compositions known to the art to-day. Steam and gas or electrically heated.

Send us a sample article and we will quote.

Complete Plans: For Pyroxylin Compounds (known under various trade names), Shellac Compounds (known under various trade names), Bakelite, Condensite, etc.. etc.

Send for our special catalogue.

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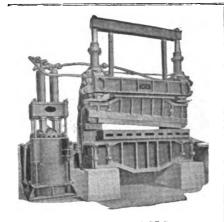
Multiple Opening Hydraulic Rod Press

diversified, we require sizes of articles and nature of material you propose to press before we can quote.

CAMDEN IRON WORKS

CAMDEN, N. J.

Builders of Machinery, Plate and Structural Work and General Founders



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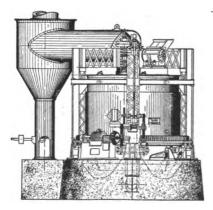
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Flanging Presses

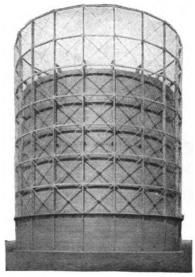
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CAST IRON PIPE FLANGED PIPE

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GAS PRODUCERS of High Capacity, for Raw or Cleaned Gases



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TANKS for Oil and Water

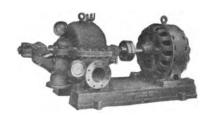
PENSTOCKS

STEEL PIPE

THEISEN WASHERS for Cleaning Blast Furnace Gas

VACUUM PANS

HAY ROPE

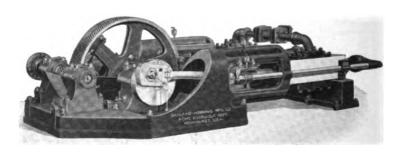


CENTRIFUGAL PUMPS

GALLAND-HENNING MFG. CO.

26th-27th Ave. and Layton Park MILWAUKEE, WIS.

Hydraulic Presses, Pumps and Accumulators



Style PH Duplex Double Acting Pump

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HYDRAULIC PRESSES:

For all purposes. Wheel Presses, Shaft Straighteners, Drawing, Stamping, Arbor, Broaching Presses, Etc.

PUMPS:

High Pressure, Vertical, Horizontal and Double Pressure Pump.

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For waste paper, rags, cotton, shoddy, etc. Also for finished textiles.

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For bundling scrap steel, copper, brass, aluminum, sheet wire and stamping.

Also soft metal turnings and shavings.

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For Grains, Starch, Glucose, Fruit Pomace, Etc.

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For bending and forming angle iron and bars.

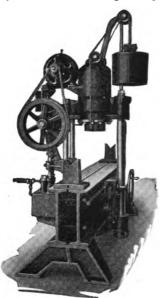
METALWOOD MANUFACTURING CO.

DETROIT, MICHIGAN

SALES REPRESENTATIVES: New York, Philadelphia, Chicago, Montreal, Toronto Manufacturers of Quick Operating Hydraulic and Hydro-Pneumatic Machinery

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MESTA MACHINE COMPANY

PITTSBURGH, PA., U. S. A.

Manufacturers of

Gas and Steam Engines for

Blast Furnaces, Rolling Mills and Power Plants Condensers, Vacuum Pumps and Air Compressors Gear Drives and Rope Drives

ROLLING MILL MACHINERY:

Chilled Iron, Sand Cast Iron. Steel, Alloy Steel and Special Rolls, Shears, Saws, Mill Tables, Manipulators, Transfers and Roll Lathes.

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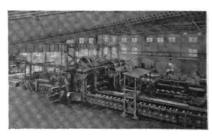
A competent and well-equipped engineering department is maintained, and estimates on your requirements will be furnished on receipt of inquiries and specifications.

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Installation of Five 46" and 84" x 60" Single Tandem Gas Blowing Engines



46" Slabbing Mill



Double Helical Cut Tooth Gear and Pinion for a 1800 H. P. Rolling Mill Drive



28" x 42" Una-Flow Steam, Engine

THE MORGAN ENGINEERING CO.

MAIN OFFICE AND WORKS, ALLIANCE, OHIO

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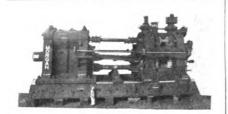
BRANCH OFFICES

NEW YORK

PITTSBURGH

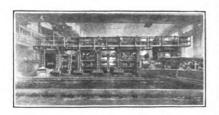
CHICAGO

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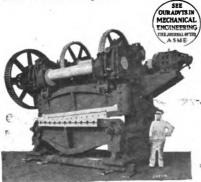
Morgan 60-Inch 2-High Reversing Universal Plate Mill

Blooming Mills, Slabbing Mills, Bar Mills, Structural Mills, and Tire Mills.



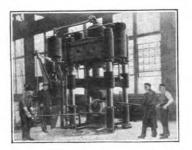
Morgan 28-Inch Structural Mill

Hot and Cold Saws. Coal Levelers and Coke Pushers. Steel Plants Complete.



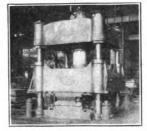
Morgan 96" x 1 1/4" Plate Shear

Plate Shears, motor driven or hydraulic. Bloom and Slab Shears upcut or downcut, motor driven or hydraulic.



Morgan 600-Ton Steam Hydraulic Forging Press Single Frame Forging Presses, 150-tons to 500-tons.

Four Column Types up to 12,000 tons. Forging Plants complete. Overhead or floor type Manipulators.



Morgan 1000-Ton Hydraulic Flanging Press

Hydraulic presses for all kinds of heavy work.

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Joggling Machines. Shipbuilding Machinery.

Drop Hammers from 800 pounds to 16,000 pounds.

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Tilting Hammers, Axle Forging Hammers, Coupling Forging Hammers.

Bulletins, Specifications and Prices furnished on request.



Morgan Steam Drop Hammer

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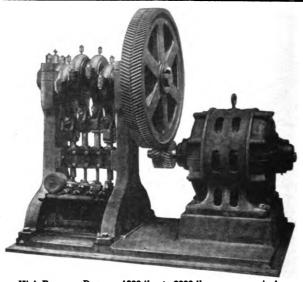
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(TUBAL CAIN IRON WORKS)

133 WATER ST., BROOKLYN, NEW YORK

Manufacturers of Hydraulic Presses and Hydraulic Pressure Pumps



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High Pressure Pumps-1000 lbs. to 8000 lbs. per square inch

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Hydraulic Valves and Fittings.

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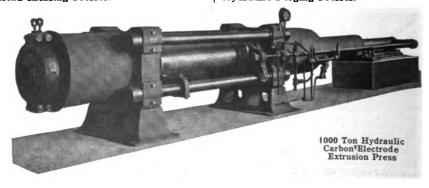
Celluloid and Bakelite Presses.

Electric Carbon Presses.

Carbon Electrode Presses.

Hydraulic Bending Presses.

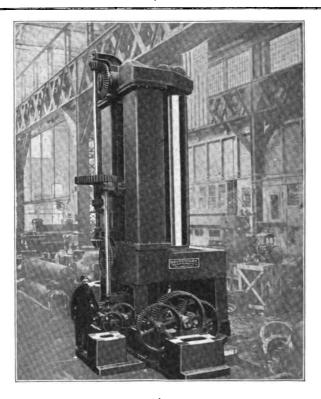
Hydraulic Forging Presses.



SOUTHWARK FOUNDRY & MACHINE COMPANY

Established 1836

400 WASHINGTON AVE., PHILADELPHIA, PA.



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DESIGNERS AND BUILDERS OF:

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BOILER SHOP EQUIPMENT
SHIPYARD EQUIPMENT
RAILROAD SHOP EQUIPMENT
POWER TOOLS
FLUE WELDERS
WASHER PRESSES
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COMPLETE HYDRAULIC INSTALLATIONS

WHEEL PRESSES BENDING ROLLS GOOSENECK PRESSES ACCUMULATORS PUSH BENCHES OPERATING VALVES TEST PRESSES VULCANIZERS TIRE FORGING PRESSES SHEARS RIVETERS KEEL PLATE BENDERS POWER PUNCHES FORGING PRESSES DRAWING PRESSES PLATE JOGGLERS PLATE PLANERS FLANGING PRESSES GATE SHEARS JIB CRANES BUSHING PRESSES SIDE RAIL PRESSES EXTRUSION PRESSES

THE WATSON-STILLMAN CO.

35 CHURCH ST., NEW YORK

Engineers and Builders of Hydraulic Machinery—Pumps, Valves, Accumulators. Intensifiers, Boosters, Jacks, Pitjacks, Lifts, Punches, Shears, Benders, Straighteners, Riveters, Coping Shears, Bolt Forcers, Baling Presses, Bulldozers, Forging Presses, Metal Extrusion Presses, Forcing Presses, Tunnel Shield Cylinders and Equipment, Etc.

In our long experience of 70 years, we have designed, built and have patterns for over 5000 complete hydraulic machines for practically every use to which hydraulic pressure has been found adaptable.



HYDRAULIC PRESSES:

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We have a standard line of presses for forcing, force fitting, assembling; presses for broaching, metal forming, metal extruding; presses for die sinking, die forming, embossing; presses for baling metal scrap, cloth, etc.; presses for briquetting of granular materials; presses for forging, drawing, tube drawing; heating presses and chilling presses for forming rubber and composition goods in molds.

HYDRAULIC ACCUMULATORS:

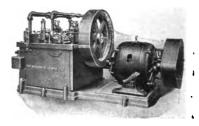


Tank Weighted Accumulator

We build accumulators in seven types, plain cylinder, inverted cylinder, yoke cylinder, plain and variable pressure, differential ram, hydro pneumatic and intensifier.

HYDRAULIC PRESSURE PUMPS:

We have given particular attention to the appurtenances necessary to complete hydraulic plant installation. Our line of pumps is complete and contains a standard type for every pressure demand up to 10,000 lbs. per sq. in. and every detail has been worked out to give the maximum of efficiency.



We are prepared to design special equipment to suit your own specifications.

R. D. WOOD & COMPANY

PHILADELPHIA, PA.

Engineers, Iron Founders, Machinists

HYDRAULIC MACHINERY:

Hydraulic Accumulators and hydraulic Presses of every description for:

Boiler and Plate shops
Car shops
Railroad shops
Steel mills
Ship yards
Rubber and Tire factories
Powder plants, etc., etc.

HYDRAULIC OPERATING VALVES:

Designed for five hundred to thirty-five hundred pounds working pressure of the leather packed piston or double spindle type. Also stop-check and shock relief valves.

AUTOMATIC GAS PRODUCERS:

Gasifying 40 to 50 tons of bituminous coal per 24 hours in continuous operation, for:

Open hearth furnaces
Soaking pits
Heating furnaces
Glass tanks
Lehrs
Smelting furnaces
Lime kilns
Brick kilns, etc., etc.

CAST IRON PIPE:

Bell and Spigot Pipe from 1 inch to 84 inches in diameter, Flange Special deep bell, High Pressure, Flexible Joint



for Submarine Work, Standard and Special Fittings, Heavy Loam and Dry 689 Sand Castings.

GENERAL MACHINERY:

Our shops are well equipped for building large machinery of every description, such as sugar, chemical and similar work.

IRON CASTINGS:

We are especially well equipped for making large and intricate loam castings; also castings in dry sand and green sand.

HYDRANTS AND VALVES:

Fire Hydrants, Mathews patents for standard and high pressure. Gate, Check, Foot and Air Valves, Valve Boxes, Indicator Posts, Foot Valve and Intake Screens, Hood Racks, etc.

CHALMERS & WILLIAMS, INC.

GENERAL OFFICE AND WORKS

1500 ARNOLD ST., CHICAGO HEIGHTS, ILL.

Manufacturers of Mining and Crushing Machinery

PRODUCTS: Symons Disc Crushers. Also, Jaw Crushers, Stamp Mills, Huntington Mills, Crushing Rolls, Chile Mills, Cyanide Filters, Revolving Screens, Pulsating Screens, Disc Crushers, Tube Mills, Ore Reduction Machinery, Rock Crushing Machinery, Gyratory Crushers and Adjustable Quick Discharge for Tube Mills.

SYMONS COARSE DISC CRUSHERS:

Crushing is done between two dishshaped discs of manganese steel set with their concave sides facing each other. These discs rotate in the same direction, at the same speed and are supported at an angle to each other.

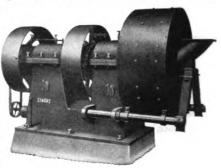
When stone is fed through the central feed opening, it is thrown by centrifugal force into the opening where the discs are widest apart. It is carried around with them to where they are closer together and is crushed in the operation. The smaller particles fly out from between the discs, into the encircling chute, while the larger particles are caught again and the operation repeated.

Advantages—Support of the feed spout is adjustable. This spout, being elliptical in cross section, is well adapted to deliver slabby pieces into the crushing cavity. The hood casing completely encloses the crushing members.

An important feature is that the manganese crushing discs wear smooth—

not in grooves. This allows them to be set closer together to take up wear.

Construction, Feed and Discharge— The stone or other material, which enters through the central feed spout shown, is quickly spread by centrifugal force over the surface of the discs. Particles are separated—not packed together. The feed is forced and the product thrown out by a force many times stronger than gravity. The quick escape of particles



broken to the proper size avoids unnecessary crushing. This prevents waste of power, avoids undue crushing strains, and results in a minimum of fines.

Size of Product—Size of product may be regulated to suit the demands of the trade by changing the distance between crushing discs.

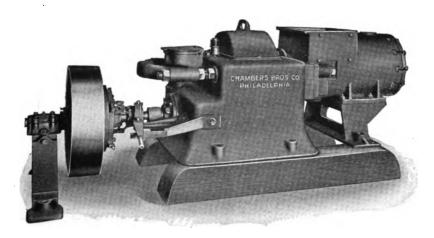
A wide range of adjustment is provided.

TABLE OF WEIGHTS AND CAPACITIES

Size of crusher	18-in.	24-in.	36-in.	48-in. 39,000 61/2 1	
Approx. shipping weight, lbs	5600 1 ½ 3%	8500 2½ ½	23,500 314		
	Size Tons of per ring hour	Size Tons of per ring hour	Size Tons of per ring hour	Size Tons of per ring hour	
Minimum capacity in tons per hour	$\frac{3}{8} = 5 - 8$ $\frac{1}{2} = 8 - 10$ $\frac{3}{4} = 10 - 12$ $1 = 12 - 15$	$\frac{\frac{1}{2} = 12-15}{\frac{3}{4} = 18-20}$ $\frac{1}{1} = 20-25$ $\frac{1}{1} = 25-30$	\$\frac{1}{4} = 25-30 1 = 30-45 1\frac{1}{2} = 45-60 2 = 50-65	1 = 45- 60 1 1/2 = 60- 80 2 = 80-100 2 1/2 = 100-120	
R. p. m. main pulley R. p. m. eccentric pulley Size of pulleys, ins. H. p. required	450 28 x 8	200 400 34 x 10 18–25	133 300 44 x 14 30–40	100 250 54 x 16 50-65	

CHAMBERS BROTHERS COMPANY

PHILADELPHIA, PA.



Number 60 Extruding Machine

691

AUGER MACHINES:

For moulding and for compressing plastic materials.

This particular machine has steam jacketed barrel, cast steel auger, forged steel die plate drilled with a large number of 36 inch holes. The provision for end thrust is most liberal. Driving gears of steel with cut teeth and encased for constant lubrication. Friction clutch driving pulley 24 x 6 inches. Unboxed weight about 3550 pounds. Other patterns of barrel and of dies will be made to order.

We specialize on:

CLAY WORKING MACHINERY

BRICK MAKING MACHINES

BRICK REPRESSES

ROLLER CRUSHERS

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THE BONNOT COMPANY

CANTON, OHIO

CHICAGO, ILL. 882 Continental and Commercial Bank Bldg. PHILADELPHIA, PA. 1402 Morris Bldg.

Pittsburgh, Pa 258 Frick Bldg Annex

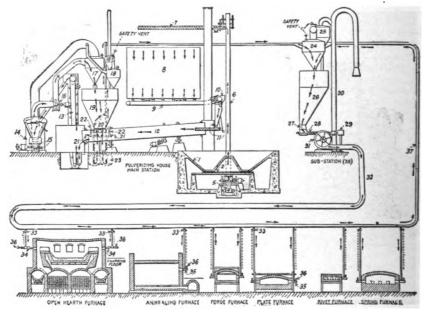


Diagram of a Holbeck Pulverized Coal Installation

HOLBECK PULVERIZED COAL SYSTEMS:

692

Central fuel storage, pneumatic distribution, for use in many types of furnaces, including boilers, cement kilns and metallurgical furnaces.

PORTLAND CEMENT MACHINERY:

Rotary kilns, dryers, pulverizers, tube mills, ball mills.

BRICK AND TILE MACHINERY:

Building Brick, Paving Brick and Hollow Clay Products.

BONNOT PULVERIZERS:

For grinding limestone, coal, etc., either with or without air separator.

BALL MILLS:

For grinding ores.

- Digitized by Google

F. L. SMIDTH & CO.

Engineers

50 CHURCH ST., NEW YORK

PRODUCTS:

Engineering:

Cement Making Factories Pulverized Coal Installations Nodulizing of Ores

Manufacturers:

Kominuter Trix Washmill Exbinner Slurry Feeder Cooler Danish Flint Pebbles Silex Linings Tubemill Lenix Belt Drive Agitators Slurry Pump Dry Feeder

Kiln Cylpebs (metallic grinding bodies) Metal Linings



DESIGN, EQUIPMENT AND ERECTION

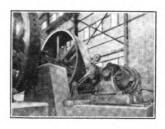
of Portland cement making factories.



KOMINUTER for wet and dry granulating.



TUBEMILL for wet and dry pulverizing.



THE LENIX

makes belt drives with short pulley centers as efficient as direct connected units, chain or gear drives, saving space, slippage, cost of belts and upkeep.



693

THE TRIX

for grading granulated materials in a wet state.

SLURRY PUMP

The economical method of transporting heavy liquids, like slurry



WASHMILL

for disintegrating and mixing clay and like materials in water.

E. H. STROUD & COMPANY

Established 1896

928, 930, 932 & 934 Fullerton Avenue CHICAGO, ILLINOIS

Engineers and Manufacturers of Machinery for the Reduction of All Sorts of Dry Grindable Materials, Animal, Chemical, Mineral, and Vegetable, and Some That Carry 6% to 8% of Moisture; also of Powdered Coal Burning Equipment

CRUSHING AND GRANULATING ROLLER MILLS:

With either pointed or chisel-shaped cutters, one pair, two pairs, or three pairs of rolls high, per mill.

Ask for Bulletin No. 200.

STROUD AIR SEPARATION PULVERIZERS:

Our illustration shows a Product Collector attached to the Pulverizer. We build Air Vent Chambers too.

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These mills give a finished product direct which, without subsequent sieving, is so uniformly fine that 95% or 98% or all of it, as wanted, will, if tested when dry, pass through a horizontal brass

wire cloth testing sieve of the desired mesh, which can be any mesh from, say, 40 x 40, down to the most impalpable powders, far finer than a 200 x 200 mesh. They are without exception the most efficient Pulverizers made. Dustless in operation. Difficult to clog. Easy to clean. A cool Pulverizer for chemicals. So automatic in feeding and operation that one man can attend half a dozen mills. Cost of milling very low.

Ask for Bulletin No. 101-A.

CAPACITY ON BITUMINOUS COAL TO 100 x 100 MESH-95% FINE

SIZE OF PULVERIZER AND ITS OUTPUT IN POUNDS PER HOUR							
Class "0"	8-10 H. P. Best Feed Size ½" cubes	650–850					
Class "1"	15-20 H. P. Best Feed Size 1" cubes	2000–2500					
Class "2"	25-30 H. P. Best Feed Size 1" cubes	4000-5000					
Class "3"	40-50 H. P. Best Feed Size 2" cubes	8000-10,000					

STROUD SCREEN SEPARATION CRUSHING AND GRINDING AND SHREDDING AND PULVERIZING MILLS:

With rigidly locked bar screens, adjustable, for making products from, say, 4 x 4 mesh down to 100 x 100 mesh. Ask for Bulletin No. 102-B. Very efficient machines of this type.

E. H. STROUD & COMPANY

STROUD POWDERED COAL STOKER AND BURNER:

Receives the Powdered Coal, draws its own supply of air from the atmosphere, measures the coal and the air as used, mixes them thoroughly, delivers the mixture to the furnace (where it ignites at once), and enables the operator to have complete control of furnace temperatures, and to make records from which

to duplicate his results at will. We build also a Stoker for Locomotives.

Sizes and Capacities from 15 lbs. to 5000 lbs. of coal per hour per stoker with all the air needed for combustion. Write for Bulletins No. 103-B and No. 107.

We have been the Pioneers in the art of pulverizing and stoking and burning Powdered Coal under Boilers and some other Heating Units.

Illustration is of our Left-Hand Stoker. We build Right-Hand as well.

Stoker can also be built for either upward or downward delivery.

Pulley or Electric Motor, or Steam Turbine, as desired.

Outlet ————of Fuel Mixture.

The Coal Tank
can be of other size
and shape, or can be
a metal barrel of this
shape, if preferred.

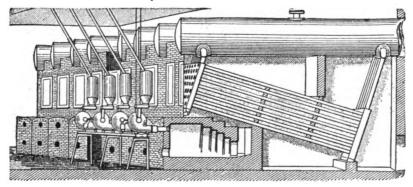
Sprockets, Chain, Worm and Gear which drive the Conveyor from spindle of fan and automatically govern the supply of coal.

and Controller.

All persons are warned that the ideas embodied in the Stroud Powdered Coal Stoker and Burner have been well covered by patents.

ROUGH SKETCH OF A TYPICAL STROUD METHOD INSTALLATION

We have purposely made an incorrect drawing of the Furnace and some other details because wedo not wish to advertise or give away gratis information which has cost considerable time and money and effort. Our installation is as simple as that shown.



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STURTEVANT MILL COMPANY

MAIN OFFICE AND FACTORY, HARRISON SQ., BOSTON (22), MASS.

NEW YORK Singer Building

CHICAGO People's Gas Building

PITTSBURGH ATLANTA
1st Nat'l Bank Building Healey Building

CRUSHERS:

Jaw, Rotary, Sledge and Roller Types for coarse, intermediate and fine reduction of hard or soft materials. Many sizes.

ROLLS:

For Crushing, Granulating, Pulverizing, Grinding. Many sizes.

PULVERIZERS:

Ring-Roll, Roller, Emery, Swing Sledge, Hinged Hammer, Disc, Stone and Laboratory. High or low speed for soft, medium, or hard, tough or fibrous materials. Many sizes.

SCREENS:

Inclined, Vibrating, Bumping, Shaking, Revolving and Laboratory. Many sizes.

AIR SEPARATORS:

For 60 mesh or finer. Many sizes.

696

ELEVATORS:

Vertical, Inclined, Open, Housed, Belt, Chain, Continuous, Centrifugal and special.

CONVEYORS:

Screw, Belt, Slat, Drag, Apron, Stationary and Portable.

MIXERS:

Batch for dry materials.

AUXILIARIES:

Chutes, Spouts, Bins, Hoppers, Feeders Valves, Scales, Connections, Transmission, etc., etc.

COMPLETE UNITS READY TO ERECT:

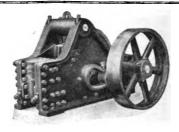
Consisting of above or similar machinery with all connections, transmission, bins, valves, etc.

COMPLETE **FERTILIZER** PLANT UNITS:

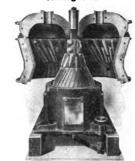
For grinding Rock, Tankage, Bone etc. For Mixing, Shipping, Unloading and Handling.

COMPLETE PLANTS (using above types of machinery) Designed. Equipped, Supervised, Erected and Operated.

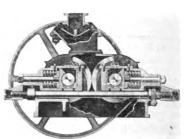
CONSULTING ENGINEERS



JAW CRUSHER Catalogue 62



ROTARY FINE CRUSHER Catalogue 63



BALANCED CRUSHINGIROLL Catalogue 65



RING-ROLL PULVERIZER
Catalogue 79

STURTEVANT MILL COMPANY

MAIN OFFICE AND FACTORY, HARRISON SQ., BOSTON (22), MASS.

7.1

New York Singer Building

CHICAGO People's Gas Building

PITTSBURGH ATLANTA
1st Nat'l Bank Building Healey Building



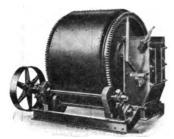
SWING-SLEDGE MILL Catalogue 84



HINGED-HAMMER PULVERIZER Catalogue 84



VERTICAL ROCK-EMERY MILL Catalogue 64



FERTILIZER MIXER Catalogue 80



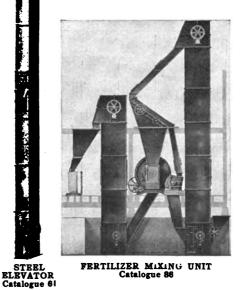
BELT CONVEYOR Catalogue 61



VIBRATING SCREEN Catalogue 77



AIR SEPARATOR Catalogue 87



FERTILIZER MIXING UNIT Catalogue 86

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WILLIAMS PATENT CRUSHER AND PULVERIZER CO.

OLD COLONY BLDG., CHICAGO

Manufacturers of Crushing and Grinding Machinery

BRANCH OFFICES: New York, San Francisco, Philadelphia, Pittsburgh, Detroit, Richmond, Va., Cleveland, Buffalo WORKS: St. Louis

COAL CRUSHERS FOR COKE OVEN WORK, BY-PRODUCT AND BEEHIVE OVENS:



By the use of the Williams Patent Hammer Crushers with the various adjustable features, the following results are obtained from the ovens: The oven pulls easier, more coke is made from each oven, the ash is reduced, the coke comes out firm, regular in size, does not crumble, and the structure is much improved.

The substantial construction of these machines is plainly shown in this cut; all parts subject to wear are easily adjustable, which includes the hammers,

the discs, the cage bars, and the breaker plates. The housing is entirely protected from wear by heavy liner plates made of heavy chilled iron. The machine is very accessible, as it is made of sectional construction.

CRUSHERS FOR ANTHRACITE MINE REFUSE:

Our Patent Hinged Hammer Debris Crushers are in extensive use for properly crushing and treating Anthracite debris or Culm before flushing it into the mines.

CRUSHERS FOR CHAIN GRATES OR STOKERS:

The Williams Patent Coal Splitter takes Run-of-Mine Coal and reduces the same to 1½", 1½", 1", 34" and finer with the "minimum amount of fine dust" the only machine made that can be regulated to properly size coal. All parts are adjustable to wear; the crusher is also adjustable to give most any size coal desired.

We also crush Coal and Pitch for Briquette Plants—for Coal Washers, before and after washing, and make a specialty of sizing Coal for all Commercial Purposes.

SPECIFICATIONS REGULAR COAL CRUSHER

Size Hopper Size Open- Feed	Capacity Tons per Hour	Speed Size Pulley	Extreme Dimensions	Horse Power	W'ght
In. 1 15x12 2 20x12 3 30x16 Run of 4 40x18 Mine 5 50x20 6 60x20	½" & ½" & ½" & finer 30 - 40 25 - 30 2 - 45 - 55 40 - 50 30 - 40 65 - 80 60 - 70 45 - 60 120 - 140 100 - 115 80 - 90 60 - 80 120 - 140 100 - 110 75 - 100 150 - 175 115 - 130 100 - 120	1000 20" 15" 1000 24" 18" 1000 24" 20"	L'gth W'th H'ght 6' 6'6" 3'9" 6' 7'6" 3'9" 6' 8'6" 3'9" 6' 9'0" 3'9" 6' 9'0" 3'9" 6' 9'6" 3'9"	20-25 30-35 50-60 75-80 100 125	P'nds 6500 7500 9500 10500 12000 16200

JUMBO SPECIFICATIONS

5 6	30x24 36x24	R.O.M.	150-175 180-200	120-140 145-165	80-100 120-140	750 750	30"	18″ 20″	8'10" 8'10"	9' 10'	5'4" 5'4"	85-100 140-150 165-185	20000 24000
	48x30 60x30		225-250 275-300	200-220 250-275	150-175 180-200	750 75 0	30″	24" 24"	8'10" 8'10"	11'	5'4"	165-185 200-250	28000 30000

BRIEF SPECIFICATIONS STOKER COAL CRUSHER

No. of Crusher	Hopper Opening, Inches	Weight	Horse Power	Capacity—Tons per Hour R. O. M. to 1½" and Finer
1 2 3 4 5	15x18" 20x24" 30x24" 40x24" 50x24" 60x24"	6500 7200 9500 10500 12000 16200	15 to 20 20 to 25 40 to 50 60 to 75 85 to 100 100 to 125	25 to 40 50 to 60 75 to 100 100 to 125 135 to 175 180 to 220

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WILLIAMS PATENT CRUSHER AND PULVERIZER CO.

RAW MATERIAL GRINDERS FOR CEMENT AND GYPSUM PLANTS:

UNIVERSAL MILL



This Universal Grinder is the only machine of its kind made. Will take DRY 2" Limestone, Shale, Clay, or Coal, and deliver at one operation a product 95% through 20 mesh TUBE MILL FEED WITHOUT OUTSIDE SCREENS OR SEPARATORS. other machine can deliver the fine uniform product year in and out.

VULCANITE RE-CRUSHER

These Vulcanite grinders will take raw material, limestone, shale, clay or coal in cubes of 3 inches and under, and reduce the same to 1/2 inch or 1/4 inch. This makes an excellent feed for those plants which use roller mills as finishers in the raw end.

We issue the following catalogs:

No. 45-E, Coal Crusher Catalog-For all those crushing and grinding coal, etc.

No. 45, Cement and Limestone Catalog -Limestone, Gypsum and Similar Grinders.

No. 45-B, Fertilizer Catalog-Bone, Tankage, Shells and Fertilizer Work.

No. 45-A, Clay Catalog-Clay, Shale, etc., for Brick, Tile and Terra Cotta.

No. 45-C, Oil Cake Catalog-Linseed, Cottonseed and Similar Oil Cake Grinders. 699

No. 45-F, Shredder Catalog-Bark, Chips, Cork and all Fibrous Materials.

No. 45-D, Stock Food Catalog-All Cereals for Feed Millers, Alfalfa, etc.

Mention material you wish to crush or grind and we shall see that you receive the proper catalog and specifications.

COMPLETE SPECIFICATIONS UNIVERSAL MILLS

Size Mill	Size Feed	Diam. Mill	per Dry	acity Hour Stone	Speed	Horse Power	Floor Space Floor Space Extreme Dimensions			Size Pulley		W'ght
		i	12 Mesh	20 Mesh	R.P.M.		L'gth	Width	H'ght	Diam.	Face	P'nds
0	1 "	18"	3/4 2- 4	1/2	1800	10- 12		5' 1"	3'2"	8"	81/2"	2500
1	11/5"	26"	2-4	1- 3	1600	15- 20	6'3"	5'10"	3'8"	16"	101/2"	4000
2	11/2"	26"	5-6	3-5	1600	20- 25	6'3"	6' 3"	3'8"	16"	121/2"	5000
2xx	2 -	26"	6-8	5-6	1600	30- 35	6'3"	7'	3'8"	20"	15 7	6500
3	2 "	40"	10-12	8-10	1100	50- 60	7'6"	6'10"	5'4"	20"	15 "	12000
4	21/2"	40"	13-15	10-13	1100	65- 75	7'6"	7'10"	5'4"	20"	'18 "	14000
5	212"	40"	16-20	15-18	1100	80-100		8' 6"	5'4"	20"	20 "	16500
9	3'2"	6ŏ″ ∣	25-35	20-30	750	150-175		9' 2"	7'2"	30"	24 "	30000

VULCANITE SPECIFICATIONS

Size Mill	Hopper Opening	Size Feed	Capacity Tons per Hour			Speed	Horse Power	Extreme Dimensions			Size Pulley		Wt.
			1/2"	1 3/6"	14"	R. P. M.	i	L'gth	Width	H'ght	Diam.	Face	P'nds
1	14'x 5"	11/2"	4	3	2	1500	15- 18	4'8"	6'3"	3'3"	16"	101/2"	4200
2	18'x 6"	2 7	7	5	3	1500	20- 25	4'8"	6'6"	3'3"	16"	1235"	5000
2xx	24"x 6"	2 "	10	8	6	1500	30- 35		7'	3'3"	20"	15 "	6000
3	18"x 8"	21/2"	20	18	15	1000	40- 50		7'	4'	20"	15 "	10000
4	24"x 8"	3 "	30	27	25	1000	70- 75		7'4"	4'	20"	18 "	12000
5	30"x 8"	3 "	35	30	28	1000	90-100		8'	4'	20"	20 "	14000
6	36"x10"	3 "	40	35	30	1000	110-125		9'	4'	20"	22 "	15500
7	40"x10"	3 "	50	42	35	1000	115-150	5'2"	9'6"	4'	22"	24 "	17500

J. P. DEVINE COMPANY

BUFFALO, N. Y.

Manufacturers of Vacuum Drying and Impregnating Apparatus

VACUUM DRUM DRYERS:

For Dyewood and Tanning Extracts, Milk and Food Products, Pastes, etc. This type of machine affords a rapid and uniform drying because the drum takes up but a very thin film of the wet material. The water is then evaporated from the material, leaving the dried sub-

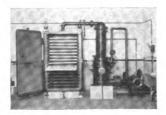


Devine Vacuum Drum Dryer

stance on the drum to be taken off by our improved method. The drying process is continuous and independent of climatic conditions, free from dust, and uniform. Adapted for all 700 solutions and liquors containing solids.

VACUUM CHAMBER DRYERS:

For Colors, Dyes, Extracts, Salts, Rubber. Smokeless Powder and High Explosives and other Chemicals and Food Products. Materials which are difficult to dry in the atmosphere without decomposition can be handled rapidly and effi-



Devine Vacuum Drying Chamber with Surface Condenser and Vacuum Pump

ciently in this type of dryer without any danger of impairing their qualities. The Vacuum Drying Chamber is designed to remove the water rapidly and at a low temperature, assuring uniform drying and low operating cost. Best suited for all materials that can be handled on trays or pans.

VACUUM PUMPS—all sizes and capacities, high efficiency units, steam, belt or motor driven.

CONDENSERS—Jet and Surface Types.
DIGESTORS, EXTRACTORS, STILLS,
FILTERS, WASHERS, PERCOLATORS.

SOLVENT RECOVERY APPARATUS. TANKS of all descriptions.

VACUUM ROTARY DRYERS:

For Starch, Granular Substances and Chemical Products. The moist material is charged into the dryer and by means of a high efficiency

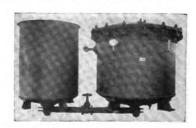


Devine Rotary Vacuum Drying Apparatus

Dry Vacuum Pump and Condenser, furnished as part of the unit, a high vacuum is produced, the vapor being pulled over into the condenser and condensed. Concentric with steam-jacketed outside cylinder is a revolving drum, heated by live or exhaust steam, to which stirring blades are attached. Material to be dried is between the inside drum and outside cylinder, kept in constant motion by the stirring blades. Thus, every particle comes into intimate contact with the heating surfaces, periodically, and a thorough, even drying results. Designed for all material that can be tossed or mixed in the drying.

IMPREGNATING APPARATUS:

For Armature, Field, Magnet and Transformer Coils, Power and Telephone Cables, Piano Sharps, Pencil Slats and other Wood Products,



Devine Impregnating Apparatus

Leather Fabrics, etc. This is a combination vacuum drying and impregnating apparatus, the coils or material to be handled first being dried under vacuum, thereby removing both air and moisture from the interior as rapidly as from the surface. The compound is then drawn into the impregnating tank, and penetrates to the innermost recesses of the material, and to render this penetration more thorough, air at ratificial pressure is admitted into the Impregnation Tank above the surface of the compound.

J. P. DEVINE COMPANY

BUFFALO, N. Y.

Manufacturers of Chemical Plants and Evaporating Apparatus

AUTOCLAVES:

All sizes and capacities. of cast steel for pressure. high also of bronze, copper, etc., equipped with or without stirring device, thermompressure eter, and safety valves and all necessary openingsin cover.

Autoclaves built in units having a holding capacity of 1/4 gallon to 250 1000 lbs.



High Pressure Steel Autoclave gallons, and for working pressure up to

NITRATING, SULPHONATING AND

All sizes and capacities made of all materials for any require-

These units built with or without stirring device, and supplied with or without reflux condensers.

Units also arranged for heating with fuel oil, gas, or steam



Nitrating Kettle jacketed.

COMPLETE PLANTS BUILT AND IN-STALLED:

For the production of Aniline Oil, Benzol, Beta Naphthol, Paranitraniline, T. N. T., Salicylic Acid, H. Acid, Naphthalene, Dimethylaniline, Dimethyldiphenyl Urea, Sulphur Black, all of the coal-tar derivatives, the higher intermediate colors and dyestuffs, etc., etc.

VACUUM PANS, EVAPORATORS:

In single or multiple effect, sizes and capacities made of cast iron, sheet steel. copper, bronze, etc., with horizontal or vertical tubes, and calandria type.



Devine Vacuum Pan

DIGESTORS, STILLS AND COLUMNS:

Built for the handling of all materials, and arranged for all requirements.



Devine Digetsor and Condenser

EQUIPMENT FOR THE CHEMI-CAL AND ALLIED INDUSTRIES.

CASTINGS FOR THE CHEMICAL TRADE:

CAUSTIC POTS STEAM JACKETED ACID RETORTS VALVES AND PIPING STEAM JACKETED VACUUM STILLS DEFECATORS VULCANIZERS

MIXING TANKS, ETC. SPECIAL APPARATUS OF ALL KINDS BUILT BY US.

Let us know the problems you have in mind, and we feel sure our past experience and engineering staff can be of service

in the solution of same.

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701

L. O. KOVEN & BROTHER

OFFICE: 154 OGDEN AVE., JERSEY CITY, N. J.

N. Y. WAREROOMS 50 Cliff Street, New York City WORKS JERSEY CITY, N. J.

Engineers, Manufacturers, Machinists and Designers. We fabricate Plate Steel, Copper, Brass, Tin, Aluminum, etc., of any shape. Designers and Makers of Special Apparatus for Manufacturing Industries

We are prepared to do plate work of every description for Ships, Mills, Mines, Factories, Plantations, Chemical Works, Paint Works, Paper Mills, Abattoirs, Fertilizer Plants, Water Works, Government Work, Sewage Systems, etc. We also make and design Special Apparatus and Machinery to meet the progress in all lines of business. WE HAVE THE FACILITIES FOR IMPROVING YOURS.

702 A Partial List of What We Make:

Air Receivers

Air Washers

Acid Tanks-Tubs or Vats

Barbers' Hot Water Boilers

Bottle Sterilizers

Can Washers

Canned Goods Sterilizers

Chemical Apparatus

China Kilns

Coil Boilers

Creosoting Tanks

Digesters

Dredge Pipe

Drying Apparatus

Exhaust Manifolds

Extractors

Filter Presses

Fruit Washers

Galvanized Tanks

Galvanizing Works

Gasoline Tanks

Gasometers

Glass Kilns

Glue Dissolvers

Ham Boilers

Hot Water Tanks

Humidifiers

Jacketed Tanks

Kilns

Lead Lined Tanks

Melting Pots

Metal Melting Furnaces

Mixers-All Kinds

Mixing Pans

Mufflers

Oil Filters

Pasteurizers

Percolators

Pipe (Riveted)

Plating Tanks

Rubber Lined Tanks

Sand Blast Tanks

Smoke Stacks

Steam Kettles

Steel Sinks

Sterilizers

Stills

Tanks (Air, Gas, Oil & Water)

Tar Kettles

Tumblers

Vacuum Pans

Varnish Tanks

Vulcanizers

Wash Basins for Factory

Washers for Canneries

Water Stills

THE PFAUDLER CO.

ROCHESTER, NEW YORK

NEW YORK 110 West 40th Street

CHICAGO 1442 Conway Bldg.

St. Louis 440 Pierce Bldg.

SAN FRANCISCO 206 Sharon Bldg.

Manufacturers of Glass-Lined Steel Equipment

PARTIAL LIST OF INDUSTRIES USING PFAUDLER GLASS ENAMELED STEEL EQUIPMENT:

Dairy Products Canned Goods Beverages Synthetic Colors Sulphonated Oils Printing Inks
General Chemicals Hydrogenated Edible

Celluloid Pharmaceuticals Toilet Preparations Fruit Products Smokeless Powders Lacquers Picrie Acid Lemon Extracts Invert Sugar

PARTIAL LIST OF SOLUTIONS PFAUDLER GLASS ENAMELED STEEL EQUIPMENT IS USED TO CONTAIN:

10% Solution of HCl Concentrated HCl 4% to 5% Sulphuric Conc. Sulphuric Acid 25% Nitric Acid

Conc. Nitric Acid Sodium Phosphate Nitrate of Mercury Zinc Chloride Distilled Water

GENERAL TYPES OF PFAUDLER GLASS-LINED STEEL APPARATUS:

Storage Tanks Mixers Cooking Kettles Vacuum Pans Percolators Crystallizing Pans Cascade Dishes Truck Tanks Nitrators Sulphonators Weight Tanks

Special Literature to the Chemical, Pharmaceutical, Dairy, Food and Beverage Industries to be had upon application.

PFAUDLER SECTIONAL STORAGE TANKS (Glass-Lined Steel):



The tanks shown are of the vertical type. They are 12 feet by 10 feet inside. Capacity 7600 gallons. Pfaudler Sectional Tanks may also be had mounted in a horizontal position. Made in a wide variety of sizes and capacities to fit individual requirements.

PFAUDLER SINGLE PIECE MIXER (Glass-Lined Steel):



The body of this tank is a single piece of Open Hearth Sheet Steel. The entire tank interior as well as the agitator is 703 enameled with Pfaudler Glass Enamel. Capacity of tank shown is 200 gallons, and it is 42 inches by 36 inches inside. It may, however, be had in many different sizes and capacities up to 2500 gallons. Prices on application.

PFAUDLER BRINE JACKETED MIX-ING TANK (for Milk, Ice Cream, etc.)



This tank is used for aging and standardizing Ice Cream or for storing Milk or other liquids which spoil at ordinary temperatures. Capacities 300 to 5000 gallons.

LOUISVILLE DRYING MACHINERY CO.

LOUISVILLE, KY.

Manufacturers of Evaporators, Dryers and Presses

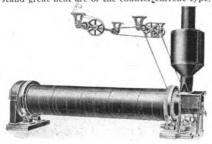
PRODUCTS: Rotary Dryers, both Steam and Fire; Tankage Dryers, Meal Dryers; Continuous Filtering Machines for pressing Starch Feeds, Brewers' and Distillers' Spent Grains.
Sugar Granulators and Coolers; single and multiple Effect Evaporators; Vacuum Pans; Salt Extractors

Extractors.

LOUISVILLE DRYERS:
The various types and styles of our Dryers are applicable to any materials that can be dried in a

Rotary Dryer.

The Fire Dryers for materials that are not injured by the gases from the furnaces and can stand great heat are of the counter current type.



704

Direct Steam Dryer

Fire Dryers: Where the materials are not injured by too much heat the heat and materials travel in the same direction. Where the furnace gases are injurious to the materials, we manufacture Indirect Heat Fire Dryers. These Dryers are manufactured in all sizes from 38" to and including 6' and any length desired. The Fire Dryers are used on any non-combustible materials that must be dried.

The Steam Dryers are for live steam and are built to stand a pressure of 100 lbs. Tubes extend through the entire length and the dryer is relieved of the condensation scientifically and continuously which gives it a capacity much greater than the other types. The dryer is made in all sizes from 38" to 72" in diameter and with tubes from 15' to 25' long. The dryer is used on all combustible materials, principally for feeds and food, and especially hay, apple pomace, starch, brewers', distillers' and kindred feeds, damp grains, tankage and materials that would be discolored by too much heat and which can be dried on a rotary dryer.

The Sugar Granulators are Indirect Rotary

would be discolored by too much heat and which can be dried on a rotary dryer.

The Sugar Granulators are Indirect Rotary Dryers. The heat is supplied by a steam battery and they are made in sizes from 1500 lbs. to 150,000 lbs. of sugar per day. The dryer is used for all materials that cannot stand a heat above 200, and which can be dried in a rotary dryer. The dryers are lined with wood, and all iron which comes in contact with the material is covered with copper for materials that are affected by coming in contact with iron.

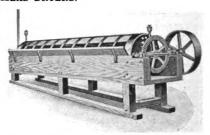
SINGLE AND MULTIPLE EFFECT EVAPORA-

We build these of the standard vertical type. They have a large circulating tube in the center. The different sizes range from twenty-four to seventy-two inches in diameter and of any height desired.

VACUUM PANS:

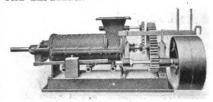
These are of the coil type and range up to and including seventy-two inches in diameter.

MEAL DRYERS:



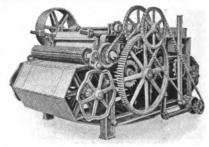
The Meal Dryers are of the Rotary type with steam pipes running the full length. This dryer is intended for meals, small grains and similar materials that would scorch if permitted to lie on hot pipes.

THE EXPELLER:



This machine is for extracting the excessive moisture in many different materials and is intended to supply the demand where a cheaper filtering machine is wanted than the Continuous Filtering Machine. It is also continuous in its operation.

CONTINUOUS FILTERING MACHINES:



Continuous Filtering Machines are intended to extract the moisture from glucose, starch feeds, brewers' spent grains, distillers' slops and kindred materials which contain too much moisture to go direct into the dryer.

The principle is a perforated sectional metalbelt passing between rolls. The material from which the excessive moisture is to be extracted is fed in here on the perforated belt and carried between the rolls. The machine is continuous in its operation. in its operation.

THE PHILADELPHIA DRYING MACHINERY CO.

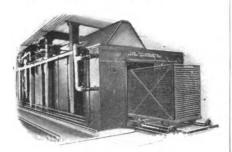
608 West 139 Street NEW YORK CITY

PHILADELPHIA, PA.

53 State Street BOSTON, MASS.

Manufacturers of Dyeing and Drying Machinery

"HURRICANE" DRYERS:



Tunnel Truck Dryer with Trays

Hurricane Dryers have proven efficient and economical and are designed to give the highest Quality of Work.

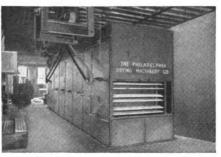
Machines built in many standard sizes and capacities. Here follow a list of some of the materials which are being dried:

Artificial Leather Leather Board Asbestos Board Linters Lithopone Nitrate of Soda Bags Asbestos Pipe Covering Binders Board Carpet Paints Chemicals Pigments China Ware Clay Wares Cloth Plush Porcelain Rags Reclaimed Rubber Cocoanut Sanitary Porcelain Silk Piece Goods Copra Cotton Spark Plugs Straw Braid Sugar Bags Terra Cotta Dyestuff Electrical Porcelain Fire Brick Flax Fruit Tobacco Gas Masks Toweling Underwear Hollow Tile Vegetables Wool Hosiery Yarn Leather

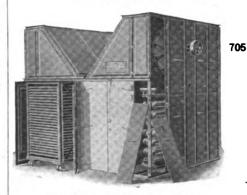
BLEACHING AND DYEING MA-CHINERY:

Complete Dyeing, Bleaching, Finishing and Drying Equipments for Hosiery, Toweling and Underwear.

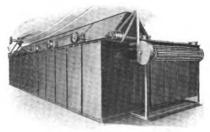
Circulating Dyeing Machines for all kinds of Skein Yarn, Braid, Tape and Raw Stock.



Automatic Drying Machine for Spark Plugs, Electrical Porcelain, Etc.



Truck Dryer for Chemicals, Etc.



Automatic Bag Dryer

Complete information and descriptive catalogs sent upon request.

SEE
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MECHANICAL
ENGINEERING
IHE JOURNAL OF THE
A.S.M.E.

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PROCTOR AND SCHWARTZ, INC.

FORMERLY PHILA. TEXTILE MACH. CO.

PHILADELPHIA, PA.

CHICAGO CHARLOTTE

HAMILTON, ONT., CAN.

NEW YORK PROVIDENCE

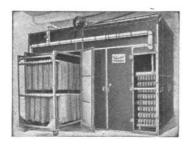
PROCTOR DRYERS:

In truck, tray, tunnel and automatic types, are made for every drying need. All-metal fireproof construction.

Proctor Engineers specialize on dryers and drying. They have studied the requirements of many industries. They have tested and proved in actual practice the solution of a large variety of drying problems. They have developed a standard line of Proctor Dryers to meet the exacting needs of the industries here listed.

Drying problems containing new ele706 ments frequently have to be solved.
The engineering facilities of the Proctor
Research Department are complete for
making tests and experiments in the drying of any kind of material. Untried
conditions and new materials are investigated on a commercial scale.

The Proctor Organization with its experience and the facilities of the Research Department is ready to coöperate with you in the design, layout and solution of any drying problem.



Proctor Yarn Dryer (Truck Type) for Cotton, Mercerized, Silk, Wool and Worsted Yarns



Proctor Dryer for Aniline Dyes, Chemicals, Colors for Printers' Inks, Lithopone, Paint Color and White Lead



for

Asbestos Board Barrel Staves Binders Board Brick and Tile Carpet Cartridges Chemicals Clay Products Cloth Cocoanut Copra Cotton Felt Hats Fruits Fur Hats Gas Mantles Glue Hair Hair Rope Labels on Cans Leather Leather Board Lithopone

Match Sticks **Paint Pigments** Paper Pipe Coverings Potato Pulp Rags Screen Cloth Shoe Shanks Silk Soap Stockings Straw Braid Straw Hats Thin Lumber Tobacco Tooth Picks Turkish Toweling Underwear Veneers White Lead Wool Yarns



In writing for a Proctor Dryer Catalog, please specify material to be dried. Submit your drying problems

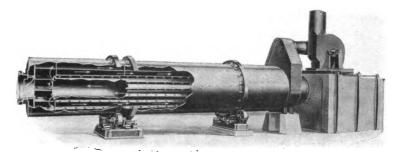
to us.

RUGGLES-COLES ENGINEERING CO.

50 Church St., NEW YORK CITY

WORKS: YORK, PA.

Consulting Engineers and Manufacturers of Drying Machinery



Section of Ruggles-Coles Dryer "Class A" Showing Direction of Gases

We build RUGGLES-COLES DRY-ERS for drying a large variety of materials. As these different materials require different kinds of treatment in drying, no one type of apparatus is adapted to all these drying problems. We have designed and now build eight distinct and standard types of machines. These cover the entire field of drying as completely as possible, but in some cases when the drying problem is exceptionally peculiar, we modify one of our regular types of dryers or make special apparatus to suit the requirements. With over twentyseven years of experience in the design and manufacture of dryers, together with the fact that we have installed over 1000 machines, we are confident of being able to handle any drying problem which may be submitted to us.

Class "A" Dryer.—The principle of the Ruggles-Coles Class "A" double shell dryer is that the hot gases pass through a long inner flue parallel to the flow of the material, then back in the annular space between the inner and outer shells and over and against the material being dried; this Class "A" dryer being two concentric shells securely connected. The inner cylinder or shell at the feed end is connected with a furnace so that the heat passes directly through this long inner cylinder. At the discharge end the gases turn from this inner cylinder into the annular space. The material is discharged either through the center of the dryer as shown on the above cut, or at the bottom, as desired by customer. This dryer is especially

adapted for drying rock, clay, coal, ores, sand, gypsum, etc.

Class "B" Dryer.—For materials which cannot be dried by direct heat, such as whiting, china clay, etc., we build a dryer similar in all respects to the Class "A" machine except that the gases are taken from the inner flue and returned through a number of tubes attached to the inside of the outer shell so that they do not come in direct contact with the material being dried.

Class "C" Dryer.—This is a steam dryer which consists of a single shell with steam header at one end, threaded into which are steam pipes. This dryer is set at a slight inclination so that the water of condensation drains in the steam head and is blown off as rapidly as formed. This machine is especially suited for such materials as grains and organic substances which must be dried out at a comparatively low temperature.

Class "F" Dryer.-Where the quantity of material to be dried is small and the amount of moisture to be evaporated is small, or where the material needs to be heated to over 450° F., we build a single shell direct heat dryer which, while not as economical in operating costs as our Class "A" dryer, is somewhat lower in first cost.

Descriptions of other types of dryers will be gladly furnished on application.

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SWENSON EVAPORATOR COMPANY

945 MONADNOCK BLDG., CHICAGO

Engineers and Manufacturers of Special Machinery

PRODUCTS:

Evaporators:

Single and multiple effects
Standard Swenson Horizontal Tube
type
Patented Seco Basket type
Patented Semi-film type "K" machine
High Concentrating type
Standard Vertical Tube Center Downtake type

Pulp Mill Machinery:

Evaporators
Leaching Batteries
Incinerators
Disc Evaporators
Melt Tanks and Agitators
Caustic Tanks and Agitators

Sugar Mill Machinery:

708

Evaporators
Vacuum Pans
Diffusion Batteries
Pre-evaporators
Juice Boilers
Juice Heaters
Beet Pulp Presses
Beet Wheels
Beet Washers
Sulphur Stoves

Special Chemical and Waste Product Machinery:

When any of our regular types of evaporators or machines do not satisfactorily meet all conditions, we design special types or combinations of types to produce the desired results.

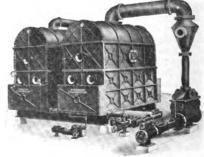
A FACTORY SCALE EXPERIMENTAL LABORATORY EVAPORATOR IS AVAILABLE FOR ALL PURPOSES.

MATERIAL HANDLED:

Any liquor concentrated in commercial quantities. The following partial list is indicative of the unusually wide range of our work:

Ammonium Chloride Beef Extract Bittern Black Liquor Calcium Acetate Calcium Chloride Caustic Soda Distilled Water for Power Plants and Ice Plants Fish Water Fruit Juices Garbage Water Gelatine Glucose Glue Glycerine Iron Sulphate Magnesium Chloride Malt Extract Mercerizing Waste Milk Whey Molasses Waste

Pepsin Potash Potassium Sulphate Salt Sodium Benzo-Sulphanate Sodium Carbonate Sodium Nitrate Sodium Sulphate Sorghum Syrup Steep Water Steffens Water Sugar Sulphite Waste Tank Water Tannin Extract Tartaric Acid Tobacco Extract Tomato Pulp Twitchell Water Western Lake Waters Wool Scourings Zinc Chloride



CATALOG:

Our catalog explains the economy of multiple effect evaporation, and the construction of the various types of evaporators, illustrated with blue prints as well as photographs. We have included tables giving:

cluded tables giving:

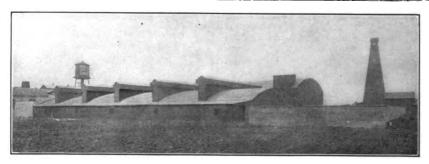
Steam and Water Consumption
for various capacities of single and
multiple effect evaporators; Relation
of evaporators to boilers and engines;
Properties of saturated steam; Steam
consumption of engines, turbines and
pumps; Comparison of specific gravity
and various hydrometer scales; and
other useful information.

Also list of customers and data required for quotations.

WILLCOX ENGINEERING CO.

SAGINAW, MICHIGAN

Manufacturers of Crystallizing Plants and Equipment



PRODUCTS:

Willcox Crystallizers and Grainers for salt, potash, saltpeter, and sodium nitrate.

Willcox Rakers for automatically and continuously delivering from the crystallizers as fast as the product is formed.

Willcox Automatic Conveyors handling and distributing the crystalline material to a refinery mill or warehouse. Willcox Bucket Elevators for handling

salt, potash, or other crystalline material.

Willcox Liquid Weighing and Measuring Machine for automatically weighing and weighing water, caustic liquor, brine,

SALT PLANTS:

The salt plant, illustrated, designed and equipped by Willcox Engineering Co., is almost automatic.

There are only two men on its payroll, one day-man and one night-man.

The plant has been in continuous operation for more than five years, producing about two hundred sixty barrels of salt per 24 hours from rather dilute brine obtained by pumping from a well 800 ft. deep.

The salt plant operates by exhaust steam from an adjoining manufacturing plant, the salt constituting a by-product of the exhaust steam.

The one-man crew carries out the following operations of the entire plant:

Pumps the brine.

Treats it with lime.

Settles the brine for 48 hours.

Preheats it.

Evaporates it in three grainers or vats, 150 ft. long by 12 ft. wide, equipped with Willcox patent submerged salt rakers which, with the system of automatic conveyors, delivers the salt commercially dry into the storage warehouse.

The residual liquor from the grainers is drawn into a fourth grainer and further concentrated, producing ice cream salt and a concentrated mother liquor which is pumped to tank cars and sold to a chemical plant for the production of bromine and calcium-magnesium chloride.

All of the foregoing operations are carried out as before stated by a one-man

The item of renewals and repairs and depreciation during five years of operation has been insignificant because of the durability and simplicity of design of the apparatus employed.

The above plant is typical of many such designs and installations that have been made by the Willcox Engineering Co. during nearly twenty years of practical experience in the design and operation of plants for the manufacture of salt and many other crystalline materials.

LIQUID WILLCOX AUTOMATIC WEIGHER:

This machine automatically weighs and records brine, caustic liquors, water of condensation from evaporators, boiler feed water.

It is a necessity in plants where a record of liquid measurements is desirable.

ENGINEERING SERVICE:

Plans and specifications prepared for complete evaporating and crystallizing plants for the treatent of brine and its by-products, and consulting service in connection with the preliminary development of proposed plants of this character, constitute a valuable help to the clients of the Willcox Engineering Co.

(See page 289 for additional products of this Company)

AMERICAN TOOL & MACHINE CO.

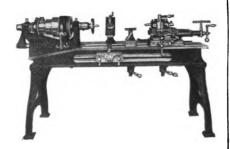
Established 1843

Incorporated 1864

BOSTON

FOX BRASS FINISHERS' LATHES:

Patented and introduced in 1857. 14 styles and sizes.



710

A constantly increasing demand for more than sixty years.

BELT KNIFE LEATHER SPLITTING MACHINE:

Splitting is the most profitable process in leather manufacture.

FABRIC COATING MACHINES:

Spreaders-Doublers

RUBBER CEMENT CHURNS:

POWER TRANSMISSION MACHINERY:

"AMERICAN" and "BOSTON" Hangers, superior in design, construction and operation.

Friction clutches and all specialties.

WESTON CENTRIFUGALS:

Patented, developed and introduced in 1866.

First developed for sugar and modified to meet every demand requiring centrifugal process.



5 Inch Hand Power

10 inch belt or motor for laboratory. 30-36-40 inch for chemicals, drugs, nitrating, salt, sugar and everywhere centrifugal process is required.

20 inch for drying small pieces that have been coated, dipped, japanned, painted, plated or washed.

20 inch to 54 inch hydro extractors for cotton, wool, silk, raw stock, yarns, fabrics, underwear.

Various sizes for special products; bottom driven, top driven.

ROPER CENTRIFUGAL OIL SEPARATOR:

For saving oil from chips and turnings. Built for more than forty years with a larger demand than ever.

Engineers-Founders-Machinists

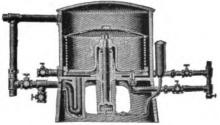
THE OIL AND WASTE SAVING MACHINE COMPANY

1509 REAL ESTATE TRUST BLDG., PHILADELPHIA

Manufacturers of Machinery for Separating and Reclaiming Oil and Waste, Centrifugal Oil Filters, Oil Extractors for Cleaning Oily Chips

IMPROVED WASTE MACHINE:

The basket or waste receptacle in the machine is driven by direct connected steam turbine, which exhausts into the basket, heating and liquefying the oil and grease, which is extracted from the waste, towels or rags by centrifugal force. The machine is then filled with water, and the waste, towels or rags thoroughly washed and sterilized, after which same is dried by the machine for future use.



Waste Machine

Guaranteed saving of 90% of the oil and all of the waste. Requires little attention. Over 3,000 machines in use. Made in 10", 15", 20" and 36" sizes with respective capacities of ½ cu. ft., 1 cu. ft., 2 cu. ft., and 8 cu. ft. of waste rags or machinery towels per charge.

TURBINE CENTRIFUGAL SEPARATOR:



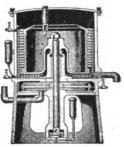
Turbine Centrifugal Separator For Extracting Oil from Metal Turnings. This machine is steam turbine driven

and the heat from the steam coming into contact with the oily chips and turnings aids the centrifugal action in producing an absolute oil extraction not procured with ordinary belt driven Separators. Machine can be operated with air. All belting and countershafting troubles and cares are entirely eliminated.

The Basket capacity of this Machine is 8 cu. ft., making it especially adaptable for the handling of long, curly and bushy turnings.

TURBINE CENTRIFUGAL OIL FILTER:

Will remove all foreign matter, all moisture or emulsion from and sterilize 711 the oil. Driven by direct connected steam turbine. The filter requires very little steam to operate same, owing to its design and its being equipped with a ball step-bearing; requires little care in operation and has practically no wearing parts.



Centrifugal Oil Filter

SPECIFICATIONS

J. 2 V				
Size	15"	20"		
Base measurements	21"x21" 30"	27"x27" 40"		
Weight	450 lbs.	800 lbs.		
Steam pressure required to operate	20 lbs.	40 lbs.		
Steam consumed per hour of operation.	83 lbs.	138 lbs.		
Oil filtering capacity	20 to 30 gals.	50 to 60 gals.		

TOLHURST MACHINE WORKS

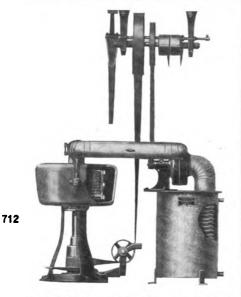
TROY, N. Y.

Manufacturers of Centrifugals

NEW YORK OFFICE: 111 Broadway

SOUTHERN REP.: Fred. H. White, Realty Bldg., CHARLOTTE, N. C. SAN FRANCISCO REP.: B. M. Pilhashy, 532 Merchants Exchg. Bldg., SAN FRANCISCO, CAL. WESTERN REP.: John S. Gage, Hartford Bldg.. Chicago, Ill.

CANADIAN REP.: W. J. Westaway Co., Main and McNab Sts., Hamilton, Ont.; 400 McGill Bldg., Montreal



TOLHURST CENTRIFUGAL METAL DRYING PROCESS:

For drying small metal articles, pearl buttons, etc., in a centrifugal.

Used in place of the sawdust tumbling barrel.

Its advantages are rapidity of operation, elimination of sawdust from the plant and a beautiful and uniform finish.

Products ranging in size from small watch parts to cabinet hardware are being successfully handled.

In use by nearly all of the largest manufacturers of small metal parts.



TOLHURST CENTER-SLUNG CHIP WRINGER:

For extracting and reclaiming oils and cutting lubricants from metal turnings, chips, etc.

Baskets 40 and 48 inches diameter.

Capacities 8.7 and 12.5 cu. ft.

Intended for economical handling of large quantities.

Inner removable basket arranged for rapid loading and quick dumping.

Write for catalogues and detailed information.

ATMOSPHERIC CONDITIONING CORPORATION

435 CHESTNUT ST., PHILADELPHIA

Canadian Representatives
DARLING BROTHERS, LTD.
120 Prince Street
MONTREAL

European Representatives
Atmospheric Stram Heating Co., Ltd.
22 Broadway, Westminster, S. W.
LONDON, ENGLAND

Representatives in the principal cities of the United States

MANUFACTURERS OF EQUIPMENT FOR MAINTAINING ARTIFICIAL AT-MOSPHERIC CONDITIONS IN INDUSTRIAL PLANTS:

The addition of the proper percentage of humidity to make up deficiency.

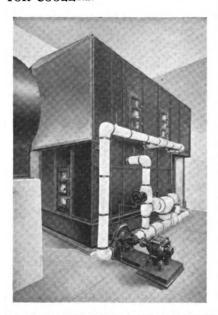
The removal of excessive humidity when high moisture content in the air prevents proper drying or carrying out of certain processes.

Maintaining either high or low temperatures where local conditions or specific materials demand such treatment.

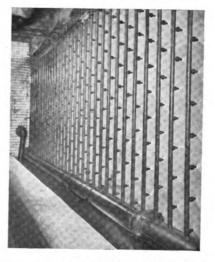
The maintenance of uniform humidity conditions within 2% of that for which it is set.

The maintenance of working spaces at the Comfort Zone to insure efficiency of employees.

The cleansing and cooling of air for the Ventilation of Turbo Alternators, equipment commonly known as GENERATOR COOLERS.



Atmospheric Dehumidifier Installed in Large Industrial Plant Manufacturing Food Products



View of Spray Chamber Showing Operation of Nozzles in Atmospheric Equipment

WEBSTER AIR WASHERS:

TYPE "A" APPARATUS, designed primarily for air washing in connection with ventilating systems in public buildings, where a moderate cooling effect by evaporation is desired.

TYPE "B" APPARATUS, designed for air washing in public buildings and industrial plants, where the greatest possible cooling effect by evaporation is desired.

WEBSTER SYSTEM OF HUMIDITY CONTROL may be applied to the various types of Webster Air Washers, Humidifiers and Dehumidifiers. Perfect in principle and accurate in operation—the chief controlling thermostat subject to water, a medium with four times the specific

heat of air.

Consult us regarding TRADE air conditioning appa-

ratus for any purpose.

Send for Bulletins as they are produced.

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713

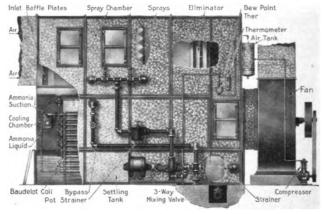
CARRIER ENGINEERING CORP'N

39 CORTLANDT ST., NEW YORK

Consulting, Designing and Contracting Engineers Specialists in Air Conditioning and Drying

BRANCH OFFICES

BUFFALO, Prudential Bldg. BOSTON, 176 Federal Street PHILADELPHIA, Land Title Building CHICAGO, Transportation Building



Illustrating a Typical Carrier Installation

714

SERVICES AND PRODUCTS:



TRADE MARK

Consultation, Designs, Construction, Equipment and Installation, complete or in part, of plants for the purpose of Humidifying, Dehumidifying, Cooling, Air Washing, Automatic Temperature and Humidity Regulation, and Drying.

EXPERIENCE AND CO-OPERATIVE SERVICE:

Our claim to consideration is based upon extensive research and experimentation by America's pioneer engineers in these lines, upon long experience in design and installation, upon enviable records by hundreds of prominent installations made under our direction, and last, but not least, upon our eagerness to keep every client permanently pleased.

By securing our co-operation with engineers or architects on difficult air conditioning work, time and money are saved and protection furnished against faulty or unsuitable selection, and proportion of parts.

A conference between your engineers and ours may show big differences between what is now contemplated and what you should have.

The Carrier System has the Flexibility to Meet Every Commercial Requirement in Air Conditioning.

Humidifying or dehumidifying alone. Humidifying or dehumidifying with heating.

Humidifying or dehumidifying with cooling.

Humidifying with cooling in summer and heating in winter.

Humidifying with heating in winter and dehumidifying with cooling in summer.

Maintenance of uniform temperature or humidity or both.

Maintenance of uniform relative humidity.

Thorough Ventilation and Air Washing in All Instances.

The performance of every Carrier installation is guaranteed upon unmistakable terms, and if you will tell us about your air conditioning problems we will send instructive literature and give you some valuable suggestions.

Exclusive rights to the Carrier methods of humidity control.

HERSH BROTHERS COMPANY

SUCCESSORS TO BICALKY FAN CO.

653 MILL ST., ALLENTOWN, PA.

BRANCH OFFICES:

BUFFALO, N. Y., 951 Niagara St.

PHILADELPHIA, PA., Perry Building

Manufacturers of Heating and Ventilating Equipment

LEHIGH

PRODUCTS:

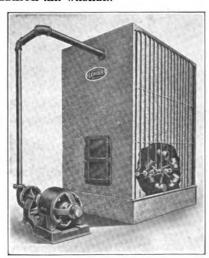
Manufacturers of Air Washers, Multi-Blade Fans, Steel Plate Fans, Roof Fan Ventilators. Blowers, Exhaust Fans, Dust Collectors, and Mushroom Ventilators.

SERVICES:

With engineering data unusually complete, we stand ready at all times to assist engineers in the study of their problems. What may seem a complicated problem may be reduced to a simple proposition through the experience of our engineering department.

Do not hesitate to ask for information.

LEHIGH AIR WASHER:



Lehigh Air Washer

This machine is designed for cleansing and cooling air by passing it through a mist-filled chamber. A series of spray heads placed in a vertical plane across the chamber produces the mist

The construction and mechanical manipulation of this air washer is such that the mist from the spray heads remains intact while flushing. This is of the greatest importance for the reason that it offers no weak spot in the mist sheets during the flushing operations to permit of any foreign matter passing through the air washer.

Automatic Flushing—A rigid shaft is placed across the air washer above the sump. This runs freely and is rotated by means of buckets filled

with falling waste water from the spray heads. Cams are arranged on this shaft, under each vertical row of spray heads, so as to operate a series of tee iron rods connected with the different rows of heads. When released by the cams these rods fall and produce a hammer blow on the center rods of the spray heads, causing a rush of water through the nozzles. This dislodges any dirt that may have accumulated in hindrance to a perfect mist spray. The cams are set so as to drop one tee at a time, which in turn flushes this vertical row of spray heads.

PLANING MILL EXHAUST TYPE FAN:

This type is constructed especially for shaving exhaust systems in planing mills. The patented wheel construction gives unusual strength and prevents racking.

The absence of rivets on the face of the blade inverse an unusually long life to the wheel as the rivets otherwise are worn by the abrasive action of the material handled. The construction of the wheel also permits the handling of long, stringy materials without clogging. This type is also constructed as a double fan. Write for catalog.

MULTI-BLADE FAN:

The Multi-Blade fan is particularly designed for use in heating and ventilating systems in public and industrial buildings, where large volumes of air are to be handled at comparatively low pressures. The patented wheel construction is unique among fans combining as it does the desirable features of the older steel plate fan with the large capacity, efficient and quiet operation of the Multi-Blade type.

The unusual strength and ruggedness of construction are readily apparent from an examination of the blades running at a tangent from the central hub of the wheel. These blades are formed of two heavy bent plates riveted together at the center to form bracing angles on the back of the blade and are so placed with reference to the hub as to give the greatest strength in the direction of rotation.

Write for catalog giving capacity tables, horsepower and characteristic curves.

STEEL PLATE TYPE FAN:

The particular advantage of this type is its adaptability for all purposes. The pressure characteristics adapt it particularly to forced induced suction in pressure systems where the pressure involved is greater than 1½ to 2 oz. Under such conditions this type is preferable to the Multi-Blade. Write for catalog giving complete data.

MUSHROOM VENTILATORS:

The Lehigh Mushroom Ventilator is made in two styles, one for wood floors and the other for concrete. Its construction is particularly simple. The patented locking device is not intricate but is very effective. The cap cannot be rotated after being fixed in position. This obviates noise caused by patrons disturbing the ventilators. Write for catalog.

715

DRYING SYSTEMS, INC.

11 S. DESPLAINES ST., CHICAGO, ILL

Contracting Engineers

Designers and Builders of Drying and Air Conditioning Equipment

SERVICES:

Designing, building, and installing of apparatus for the conditioning, aging, or drying of all commodities that may be so treated, in entire buildings, floors or rooms, compartments or cabinets, dry kilns or tunnels by the application of currents of air which are controllable as regards volume, heat, and moisture content.

Among the materials which may be treated in this manner are the following:

Biological Products

Chemicals

Dimensioned Stock (Lumber)

Dry Colors Dye Stuffs

Fruits and Vegetables

Glued-up Stock (Veneered panels)

Herbs

716 Leather

Pharmaceutical Products

Rubber, crude washed

Rubber, reclaimed

Soap

Siccative Coatings, such as:

Enamel

Shellac Filler

Lacquer Stain

Paint Varnish

Applied to Wood, Metal, Leather and Fabric for the following industries:

Primer

Automobile (bodies, chassis, wheels)

Furniture

Office Equipment (wood, metal)

Pianos

Talking Machines

Trucks

Tractors

Agricultural Implements

Aeroplanes

Having made a large number of installations for most of the above materials, tentative estimates can be furnished without further investigation. Tests in our laboratory on customer's samples obtain the necessary data for estimating the cost of equipment for the drying of any materials for which such data have not been previously established. These tests are made free of charge.

PRODUCTS:

(a) Wenborne-Karpen type of drying and conditioning rooms, embodying the principle of air circulation by means of alternately heating and cooling the air. Heating and cooling coils located within dryroom. We will furnish equipment partly or complete, or if purchaser prefers, blue prints and specifications only.

(b) The Greeff System of Drying and Conditioning comprising the Greeff Static



Greeff Equipped Finishing Room

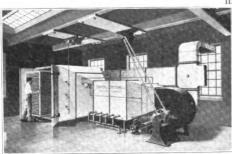
Air Washer-Humidifier, eliminators, heating coils, automatic temperature and humidity controls and fan. This equipment is placed in more or less close proximity to the room, or series of rooms, to which the conditioned air is led by means of ducts. Properly spaced air supply nozzles and vent ducts insure a thorough circulating of air within the rooms and an adjustable recirculating system affects a large saving in operating expense. While the above two systems are largely used by manufacturers of automobiles, pianos, talking machines and furniture, they are applicable to many other commodities, and may be installed in connection with rooms, kilns or tunnels, for continuous or periodical loading.

(c) The Compartment Type "W" for fast drying of materials placed on trays. Each compartment, holding one rack or truck, is equipped with oscillating dampers which cause a uniform drying in every portion of the rack. The air is washed, if necessary, passed through stacks of heaters, and by means of a fan forced through each compartment in-dependently. Air is largely recirculated

DRYING SYSTEMS, INC.

to utilize the beneficial effect of moisture and to reduce operating expense. This system is suitable for medium sized production.

(d) The Tunnel Type "G" for economic drying of materials placed on interlocking trays which are stacked to form a rack. The unloading of the rack contents is accomplished by means of a dumping device. The air is washed, if necessary, then by means of a fan, forced through heater stacks into and through the tunnels. Temperature is automatically controlled; likewise the humidity whenever required. This system is suited to quantity production and is continuous.



Single Compartment Dryer

- (e) The Merrill Process of Fluid Heat Transmission furnished us by the Parks-Cramer Company, whenever any of the aforementioned systems are installed for working temperature above 225° F.
 - (f) Trays, Racks and Trucks.
 - (g) Conveyors of every type.
- (h) Housing and doors for compartments, dryrooms, kilns, and tunnels; or blue prints and specifications for same in the event that customer prefers to build his own.

Whenever any of the foregoing systems are installed for the purpose of drying varnish, paint and similar finishing material, the user is afforded the protection of a license under U. S. Patent No. 1,186,477 issued to Dr. Wm. M. Grosvenor. This covers a process of drying and hardening siccative coatings by heat in the presence of added moisture, which is the only practical method to prevent premature surface hardening. Its application results in the production of a superior finish, a considerable saving in time and corresponding saving in space and working capital. It enables the user to establish a definite finishing schedule

independent of weather conditions, an accomplishment unattainable before the introduction of this process. The leading manufacturers of Automobiles, Airplanes, Motor Trucks, Agricultural Implements, Furniture, Office Equipment, Pianos and Talking Machines are using our equipment in the execution of this important process. Our system has also found favor with manufacturers in its application to the conditioning of the rooms in which these siccative coatings are being applied, and for the final curing of the rubbing varnish and the flow coat. The results of each of these installations were a marked improvement in the efficiency of the working force as well as the appearance of the finished surfaces.

Inquiries solicited:

When sending your inquiry give us all data upon which to base our estimate:

- Description of material (sample if possible)
- 2. Output per hour in dry weight
- 3. Specific weight (and heat, if known)
- 4. Moisture content in wet material
- 5. Moisture content in dry material
- 6. Form in which material will reach dryer (filter cake, bulk, etc.)
- 7. Maximum temperature to which material may be subjected in drying
- 8. Drying method now employed; if spread on tray, give thickness of layer and time of drying now required together with temperature used
- State if nature of your production requires periodical charging of dryer or if it favors continuous drying
- 10. Advise your preference as to the size of trays, if any, or to the material for making trays or conveyors, also if your wet product contains any substance which by direct contact or by its fumes affects ordinary building materials, such as iron, steel (black or galvanized) or wood
- 11. State if, and when, material sufficient for a drying test (20 to 50 lbs.) is available, should we find such a test necessary

Descriptive bulletin sent upon request.

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PARKS-CRAMER COMPANY

FITCHBURG, MASS.

BOSTON OFFICE 1102 Old South Bldg.

SOUTHERN OFFICE AND SHOP CHARLOTTE, N. C.

Industrial Piping and Air Conditioning

PARKS-CRAMER SPECIALTIES:

The Merrill Process of Fluid Heat Transmission: A means for obtaining and transmitting heat at high temperatures and low pressures for industrial processes. Superior to superheated steam, electricity or direct fire.

A special non-explosive fluid, mechanically circulated, passes through a scien-Absorber. tifically constructed heat Thence it is delivered through pipes to the apparatus to be heated—jacketed kettles, stills, tanks, etc. After delivering a certain predetermined portion of its heat, the circulating fluid returns through the pump to the Absorber for re-heating. The entire system is under static pressure from an expansion tank open to the atmosphere. The only added pressure, rarely exceeding 25 lbs., is that required to maintain circulation against internal frictional resistance.

718 The system is applicable to the following industries:

Chemical plants.

Rubber works.

Asphalt melting and coating plants.

Melting and refining works.

Oven heating.

Tapanning plants.

Paper coating mills.

Canning factories.

Shoe shops.

Plants using hot calender rolls or presses.

Varnish, paint and shellac works.

Each case is a separate engineering problem. On request preliminary data sheets will be furnished from which tentative estimates may often be sub-mitted. These must invariably be checked later by a personal inspection of local conditions before a definite contract price can be quoted. Our engineers are always at your service for consultation.

Air Conditioning System:

No one system of air conditioning will fulfill all requirements. Sometimes the problem is one of humidification only; sometimes it is air washing, or heating in addition. Sometimes two or three of these requirements exist as one problem. A-Central Station Equipment for

1—Ventilating 4—Humidifying 2—Cooling 5—De-humidifying 3—Heating 6—Air Cleaning

B-Fan Driven (High Duty) Humidifiers

1-Local or inside use

2-Wall ventilating type

3-Belt driven fan

4—Electrically driven fan 5—Water motor fan

C-Atomizer Type Humidifiers for 1-General Mill Use, best adapted to

old or low posted rooms

2—Special applications on pickers

3—Compressed air cleaning as byproduct

D—Spray Type Humidifiers Same as the high duty, without fans. Not as effective as high-duty

E-Recording and Indicating Apparatus; Valves, accessories, etc.

The Turbo Oil Sprayer is especially efficient in spraying oil on wool or worsted, or conditioning cotton after drying. Perhaps its most frequent use is for the application of oil-while in process-on feed aprons of mixing pickers, or Fearnaught Pickers.

Advantages: Saves oil, labor, time of picking; makes for less waste in carding and spinning, more uniform weight, more production, better product, easier scouring.

Humidity and Temperature:

Regulation: Our regulators embody the result of many years of pioneer work. The wet bulb temperature is maintained without the use of rags or wicks. movements are positive, produced by rugged metal diaphragms, expanding and contracting with temperature. The result is an instrument of precision that is also rugged and dependable.

Industrial Piping: In this department, both as engineers and contractors, all kinds of industrial piping problems are handled, such as— Power Plant Piping.

Forced Circulation Hot Water Heating. Fuel Conservation Engineering and Piping.

Automatic Sprinkler Fire Protection. Pipe Bending.

SKINNER BROS. MFG. CO., INC.

1400 to 1490 Vandevanter Ave., ST. LOUIS, MO.

Manufacturers of Baetz Heating Systems, Drying Systems for All Purposes

BAETZ AIR-HEATING APPARATUS:

The Baetz Patented Air Heating System is in successful operation in many of the largest foundries and industrial plants in the United States and it has been demonstrated time and again to be the



Skeleton View of Baetz Heater

ideal system for the heating of large exposed buildings.

We are willing at any time to back our judgment by placing BAETZ PATENTED AIR Heating Systems on trial for heating, drying or removal of steam, in any plant no matter how exposed it may be and we will guarantee satisfactory results or remove the system without cost.

Construction of the Baetz Heater:

The Baetz Patent Heater is constructed of heavy steel plates and angles. The upper part is occupied by coils of steam pipe. The blower or fan is placed beneath them in the same enclosure.

The air is drawn in by the fan from two sides and is forced upward against the steam-heated coils, and passing out at top as heated air. The fan does not handle heated air, but takes cold air as it passes directly into blower.

The Warming System:

The Baetz system of factory warming provides an even distribution of warmth throughout even the largest buildings, without use of distributing pipes.

This result is possible of accomplish-

ment only because the Baetz Air Heater draws cool air in at the bottom and discharges it vertically through the heating coils. This causes a steady, though unnoticeable, movement of all air within the room, the heated air constantly moving away from heater and towards the walls, where it becomes cooler and falls, then is drawn back and into the blower to be heated again.

Various Uses of the Baetz Heating System:

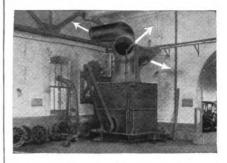
Some of the large packing houses and paper mills which are troubled with steam or vapor have them installed for the purpose of removing this difficulty. For drying purposes they are used in fire brick works, candy manufacturing concerns, shoe manufacturing concerns and others whose business requires a drying system.

Special Features:

Live steam direct from boiler, or exhaust steam may be used.

719

Heater is shipped set up, ready for steam connection.



Installation of Anheuser-Busch, St. Louis, Shows Three Outlets Supplied from One Heater

Floor space occupied is less than onethird of what any other system requires.

Low cost of maintenance and uniform heat distributed.

Units can be removed from place to place, as there are practically no pipes or distributing ducts used with our installation.

THE AUTOMATIC REFRIGERATING CO

MAIN OFFICE AND WORKS, HARTFORD, CONN.

BRANCH SALES AND SERVICE OFFICES:

New York City Boston, Mass. Chicago, Ill. Atlanta, Ga.

720

San Francisco, Cal. Los Angeles, Cal. Seattle, Wash. Rochester, N. Y.

AGENCIES: Baltimore, Md.; Houston, Tex.

Washington, D. C. Cleveland, Ohio Louisville, Ky. New Orleans, La.

AUTOMATICALLY CONTROLLED REFRIG-ERATING AND ICE-MAKING PLANTS:

These plants (fully patented) are designed to provide mechanical refrigeration without the necessity of an operating engineer. Automatic devices absolutely control starting and stopping of machine as temperatures in boxes rise above or fall below predetermined points, and also control ammonia expansion and feed of water to condenser. Safety devices immediately stop plant in case of trouble with water or electric power service.

power service.

Compressors: The compressors are of the vertical, two cylinder, single acting enclosed type of rugged construction built to gauge with parts interchangeable. They have safety heads, balanced suction valves and adjustable discharge valves. Cylinders and pistons are specially designed to prevent oil pumping into expansion piping. All wearing parts can be replaced at small expense from the large stock of parts always carried. Machines of this construction can never wear out, and can always be kept at the highest efficiency.



Compressor Capacities: Single units from 1000 pounds to 32 tons Refrigeration per 24 hours.

Automatic Control: The control equipment is thoroughly reliable, and is rugged in construction.

Automatic Refrigeration originated with, and has been developed to its present state of perfection by this Company. These Automatic control devices are fully patented, and are manufactured exclusively by this Company, and installed only in connection with apparatus put out by this Company.

Thermostat: The Thermostat automatically controls the starting and stopping of the machine so as to maintain any desired temperature within a degree or two of a predetermined point.

It insures that power is consumed only when the temperature requires it. As it is used with our automatic electric control panel, there is no arcing or pitting of the contact points.

Automatic Switchboard: The starting and stopping of the motor by the various automatic devices are through a specially designed switchboard which has automatic safety devices that shut the machine down and cut off all power in the event of trouble in the electric service, preventing danger of damage to motor.

Automatic Expansion Valve: The Expansion Valve automatically controls the feed of ammonia to the expansion coils, thus maintaining the most economical pressure for the expansion of the liquid ammonia in the coils. It is easily adjusted, and functions perfectly.

Automatic Water Regulator: The Water Regulator automatically controls the flow of water to the condenser, and automatically adjusts the water use to the requirements of the plant. The action of the water valve is powerful and positive, and water waste is eliminated.

Automatic High Pressure Safety Cutoff: This device automatically stops the machine should the head pressure approach the danger point, due to failure of water supply or any other cause. It puts the plant in operation again when the cause of the high pressure is eliminated.

Repair Parts: All parts of the plant are of superior construction and are interchangeable. A stock of parts is always carried which can be shipped promptly. No delay or holding up of apparatus while a new part is being constructed.

Advantages: The Automatic Refrigerating plant will produce refrigeration at a lower cost than any other electrically driven refrigerating machinery. The plant requires practically no attention other than occasional oiling and cleaning of the machinery.

The temperature is a superstance in the supe

The temperatures in any number of refrigerators can be maintained at any desired point by one plant. Air circulation in refrigerators is always lively as ammonia is always present in coils.

The many advantages of refrigeration by direct expansion can be fully realized through the Automatic plant. There are many Automatic plants cooling from ten to fifteen refrigerators at different temperatures on the one direct expansion system. The elimination of the cost of operating a brine pump and the extra equipment required for an indirect system, is possible only with an Automatic plant.

An Automatic plant can be located anywhere in a building without reference to the location of the engine room. This is an especially desirable feature for engineers designing equipment for factories and public buildings.

Engineers and Architects are urged to use the expert services of the Engineering Department of this Company to assist them in the solution of special problems in application of mechanical refrigeration. Factory drinking water, Restaurant and Commissary Department installations are applications whose possibilities are beginning to be appreciated.

CARBONDALE MACHINE COMPANY

GENERAL OFFICE AND WORKS

CARBONDALE, PA.

BRANCH OFFICES

NEW YORK, N. Y., 171 Christopher St. Baltimore, Md., 304 Continental Bldg. Philadelphia, Pa., 1009 Harrison Bldg. Louisville, Ky., 217 Norton Bldg.

CHICAGO, ILL., 1325 Manhattan Bldg. NBW ORLEANS, LA, 904 Title Guaranty Bldg. PITTSBURGH, PA., 1122 Allegheny Ave. BUFFALO, N. Y., 380 Ellicott Sq. Bldg.

PRODUCTS:

Refrigerating Machines (Ammonia Compression and Exhaust Steam Absorption Systems); Paraffine Wax Machinery, consisting of Distillate Chilling Machines, Hydraulic Filter Press, Pumping Equipment, Sweating Pans, etc.; Ice-Making Plants; Steam and Power Aqua Ammonia Pumps; Ammonia Economizers; Brine Coolers; Ammonia Fittings; Liquid Carbonic Acid Gas Plants. We are prepared not only to furnish these machines but to design and install complete plants.

REFRIGERATION:

The line of Ammonia Compressors, together with the "Carbondale" Exhaust Steam Absorption Machine, enables us to meet the requirements of refrigeration for any purpose. The Ammonia Compressor is the Feather Valve (Registered U. S. Patent Office) Compressor built at the Laidlaw Works of the Worthington Pump & Machinery Corporation for exclusive Engineering by us.

Some Advantages of Feather Valve (Reg. U. S. Pat. Off.) Used in Carbondale Compression System.



Worthington Feather Valve (Reg. U. S. Pat. Office)

The steel strips weigh less than a half ounce making a quiet, durable valve that is in decided contrast to the old, heavy, cumbersome types. The valve has no springs, buffer plates or cushioning devices. Seating is by contact—not impact. Pressure on the extremely flexible strips makes the valve tight—no leakage.

We are prepared to furnish Feather Valve Ammonia Compressors in the following combinations: Single Cylinder and Duplex Belt Driven; Duplex and Two-Stage Direct Connected to Electric Motor; and Single and Duplex Steam Driven, using slide valve, Corliss, Corliss Compound or Stumpf Uni-Flow Engine direct connected for operating same.

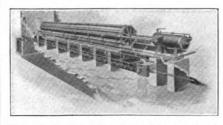
Advantages of Carbondale Absorption Refrigerating and Ice Making Machinery:

(1) Will operate with exhaust steam under a slight back pressure. (2) No heavy moving parts. (3) Noiseless. (4) No heavy foundations. (5) Very little attention required. (6) Adapted for any floor space or headroom.

CHILLING MACHINE:

The Carbondale Patented Distillate Chilling Machine offers the most efficient method of cooling both medium and zero cold test oils.

FILTER PRESS:



Hydraulic Ended Filter Press Showing Conveying Mechanism

The Carbondale Filter Press, having flexible plates, is especially adapted for filtering under high pressure.

It is used for the efficient separation of solids from liquids, such as paraffine wax from petroleum distillates, carbon from coal tar and for other purposes where high pressures are necessary in the operation.

CARBONDALE SERVICE:

In our plant at Carbondale, Pa. we maintain a large staff of engineers specially trained in solving refrigeration problems. Their services are freely offered to architects, engineers and purchasers without charge. The spirit of coperation evidenced by this department has been a large factor in placing successful installations in such plants as these: E. I. du Pont de Nemours Co.; Walter Baker Co.; Standard Oil Company; Armour & Company; Chapin-Sacks Mfg. Company; Buffalo Cold Storage Company; Crane & Company; LaSalle Hotel, Chicago.

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FRICK COMPANY, INC.

MAIN OFFICE AND WORKS

WAYNESBORO, PA.

Manufacturers of Refrigerating and Ice-Making Machinery

CANADIAN REPRESENTATIVES

THE FRICK ICE & REFRIGERATION CO., MONTREAL, CANADA BRANCH OFFICES

ATLANTA, GA.
BALTIMORE, MD.

CHICAGO, ILL.

NEW YORK, N Y. DALLAS, TEXAS

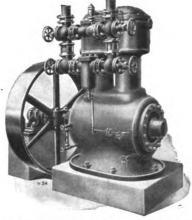
PHILADELPHIA, PA.

PITTSBURGH, PA.

PRODUCTS:

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REFRIGERATING AND ICE-MAKING MACHINERY, AMMONIA AND CO₂ COMPRESSORS, AMMONIA CONDENSERS, AMMONIA COOLING COILS, BRINE COOLERS, CORLISS ENGINES, AMMONIA FITTINGS, AMMONIA PIPING, FREEZING SYSTEMS, NU-FRICK RAW WATER FREEZING SYSTEM, STEEL TANKS, BOILER SYSTEMS, WELDED DOUBLE COILS, ETC.

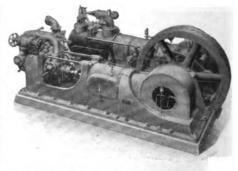


Frick Enclosed Type Refrigerating Machine-Arranged for Belt Drive

FRICK Machines and Equipment have been on the market for 39 years. They are used in all the varied industries requiring refrigeration for cooling purposes, for the conservation of food products, and for the manufacture of ice.

TYPES OF MACHINES:

Vertical Single-Acting, Horizontal Double-Acting, Absorption. Adapted to any available power. Machines are built in units of size to suit requirements from ½ ton to 1,000 tons.



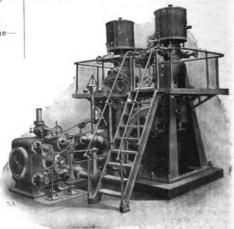
Frick Medium Speed Ammonia Compressor, Steam Driven

CATALOGUES:

Frick Machines and Equipment are described in detail in well-illustrated catalogues, which will be forwarded on request.

ESTIMATES:

A competent and well-equipped engineering department is maintained, and estimates on your requirements will be furnished on receipt of necessary information.



Steam-Driven Ammonia Compressors—Medium Size—Vertical Type

YORK MANUFACTURING CO.

Ice Making and Refrigerating Machinery Exclusively

MAIN OFFICE AND WORKS

YORK, PA.

BRANCH OFFICES

BOSTON, MASS., 88 Broad Street

BROOKLYN, N. Y., Shipley Building

BUFFALO, N. Y., 78 Main Street

BUFFALO, N. Y., 78 Main Street

PHILADELPHIA, PA., 2222-28 Arch Street

PITTSBURGH, PA., 47-49 Terminal Way, S. S.

CLEVELAND, OHIO, 1106-08 Woodland Ave.

ATLANTA, GA., 116-18 Central Ave.

CHICAGO, ILL., 26-28 North Clinton Street

TORONTO, CAN., CANADIAN ICE MACHINE

CHICAGO, ILL., 26-28 North Clinton Street

TORONTO, CAN., CANADIAN ICE MACHINE

OMAHA, NEB., 1213-17 Jackson Street

DENVER, COLO., 2121-31 Market Street

HOUSTON, TEXAS, 2201 Texas Ave.

NEW ORLEANS, LA., 619 Baronne Street

SAN FRANCISCO, CAL., 332-38 Folsom Street

LOS ANGELES, CAL., 306-308 Boyd Street

SEATTLE, WASH., 508 Terry Ave., North

TORONTO, CAN., CANADIAN ICE MACHINE

CHICAGO, ILL., 26-28 North Clinton Street

TORONTO, CAN., CANADIAN ICE MACHINE

CHICAGO, ILL., 206-28 North Clinton Street

LTD., Villiers & Munition Streets

PRODUCTS:

ICE MAKING and REFRIGERATING MACHINERY which includes: Compression Refrigerating Machines, Absorption Re-



Vertical Single-Acting Enclosed Refrigerating
Machine

frigerating Machines, Ice Making Plants, Refrigerating Plants, Ammonia Valves, Ammonia Fittings, Ammonia Condensers, Brine Coolers, Aqua Ammonia Pumps, Ice Cans, and all parts needed to equip a complete ice making or refrigerating plant.

DESCRIPTION:

We make, in our own factory, all the machinery and apparatus used in ice making and for general refrigeration, confining ourselves to the ammonia system, both compression and absorption types, and the CO₂ system.

SIZES:

The enclosed machine is built in sizes from 1/8 ton refrigerating capacity upwards; the vertical single-acting machines from 20 to 600 tons; the horizontal double acting machines from 10 to 600 tons-either belt or steam driven type. Ammonia absorption and carbonic anhydride (CO2) machinery of any capacity required by the trade.

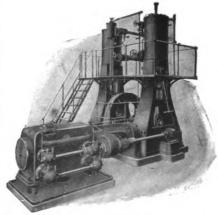
APPLICATION:

These machines can be used wherever ice making or refrigeration is required, the style of machine being determined, to a great extent, by local conditions.

The enclosed machine is particularly adapted for residences, apartment houses, small hotels, creameries, ice cream factories, etc.

VALVES AND FITTINGS:

York Ammonia valves and fittings are guaranteed to give satisfaction under all usual working pressures.



Vertical Single-Acting Refrigerating Machine Direct Connected to Uniflow Poppet Valve Engine

SERVICE:

All York agencies carry in stock a complete line of ammonia valves and fittings, also a line of enclosed machines.

What a service department is to the owner of an automobile, the York Sales Organization is to the user of ice making and refrigerating machinery.

Both quality and service can be secured by patronizing the York Organization,

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723

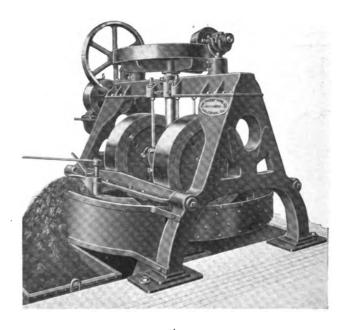
THE FROST MANUFACTURING CO.

Established 1851

WORKS GALESBURG, ILL.

GENERAL SALES OFFICE 112 W. ADAMS St., CHICAGO

Manufacturers of the Frost Wet Pan for Steel Foundries
Also Dry Pan for Clay Crushers



724



WET PAN SAND MILL:

For Preparing Sand

for Foundry Mixtures.

The Frost Sand Mill is built on the principle of plowing, turning, kneading, and pressing the sand and materials to be mixed. We use heavy mullers bearing on chilled iron grinding plates which revolve in a plane at right angles to and immediately underneath and in contact with the mullers. Aided by centrifugal force, the

mixture is thrown out by the mullers to be turned by the plows and again guided or plowed back under the mullers. When the mixing is thorough (a matter of from one to two minutes), the unloader, which at other times serves as one of the plows, is set and the mixture immediately discharged from the pan.

Spring suspension of mullers enables operator to gauge pressure exerted to requirements of the mixture.

Our design is such that parts which take the wear of the milling and kneading can be renewed at a minimum cost.

Furnished for direct connected electric or belt drive.

Built in sizes of from ½ to 1½ yards capacity per batch.

(See page 69 for additional products of this Company)

McLAIN'S SYSTEM, INC.

802 GOLDSMITH BLDG., MILWAUKEE, WIS.

Foundry Systems and Methods

Every Industry Has Its Science—

McLAIN'S SYSTEM is the SCIENCE

OF THE FOUNDRY. By addition of

30% steel, strength is increased 20 to

60% over gray iron with a corresponding
reduction of section. Scientific cupola

practice is absolutely necessary to pro
duce McLAIN'S SEMI-STEEL.



By actual test semi-steel gears wear better than steel,



Automobile Piston 20% Steel

Lighter than aluminum because of 725 thinner section. Only 1/12 inch thick when cast—machined to 1/12 inch.



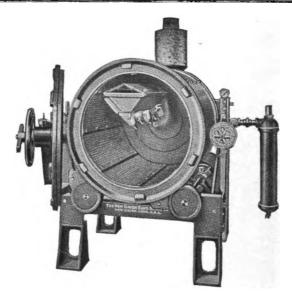
Motorcycle Cylinder 20% Steel

Semi-steel Booklet Free

NEW HAVEN SAND-BLAST CO.

NEW HAVEN, CONN.

Manufacturers of New Haven Patent Sand-Blast Machines



72

ARE YOU CONSIDERING SAND-BLAST?

If so, stop and consider the merit of construction before placing your order. The cost of maintenance after machine is installed is a very important factor and should not be overlooked.

The New Haven Self-Contained Sand-Blast Barrel is the only barrel made that cleans the work, removes the dirt and recovers the sand to be used again all inside the barrel. This feature keeps the rollers, bearings, etc., away from the dust and dirt caused by the blast and avoids excess wear that increases costs and retards production.

CLEAN YOUR FORGINGS by sandblast; it eliminates all the discomforts and expense of acid. The work is more satisfactory; your plant is clean and your employees are given a wholesome atmosphere to work in.

CLEAN YOUR WORK FOR GAL-VANIZING by sand-blast; you will obtain a cleaner and better surface than by any other method. Our barrel will do the work of four or five men with scratch brushes, increasing your production and reducing your costs.

CLEAN YOUR CASTINGS by sandblast; the same benefits are derived as from forgings. Do not stop to knock out cores by hand. THE NEW HAVEN SELF-CONTAINED SAND-BLAST BARREL will remove the cores and remove all dirt for you.

Send for catalogue A. E. stating your requirements and we will be glad to give you the benefit of our experience.

WM. H. NICHOLLS CO., INC.

2 COLLEGE PLACE, BROOKLYN, N. Y.

Manufacturer of Molding Machines, Plain Jolts, Split Pattern Stripping Plate, Double Faced Match Plate and Roll Over Attachments, Vibrators, Patterns—Wood and Metal, Flask Cranes and Accessories



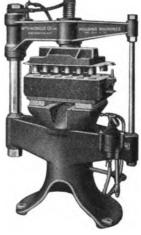
10-32 Model D Split Pattern Plate Machine

Heavy inverted type combination jolt power squeezer with drawing device for split pattern plates up to 13½ by 18½ inches.



10-32 Combination Jolt and Power Squeezer

For double faced match plates, hard sand matches with gated patterns, shallow split pattern plates and loose pattern shallow drags or copes.



10-32 Model E Combination Jolt and Power Squeezer

727

Equipped with electromagnetic pattern drawing devices, it performs all operations.

Nicholls molding machines are used wherever economical quantity production of molds for castings is desired. They are simple in construction, cost little for upkeep and are easily operated without skilled molders.



8-36-48 Plain Floor Jolt

Capacity up to 12 inches piston for core rooms and flasks up to 60 by 72 inches.

Send for Catalogs.

PANGBORN CORPORATION

P. O. BOX 859, HAGERSTOWN, MD.

Engineers, Designers and Manufacturers Exclusively of SAND-BLAST AND ALLIED EQUIPMENT



The "Pangborn" line embracing, as it does, every practical system of sand-blasting, assures the user of counsel unbiased by limited designs and equipment. Hose Sand-Blasts, Sand-Blast Guns, Cabinet, Table and Barrel Sand-Blasts in single units or in combination

and with specially designed rooms and ventilating systems to meet the individual conditions, cover every demand from the smallest to the largest.

A corps of experienced Sand-Blast engineers study individual problems, assuring equipment and arrangement so necessary to economy of production. Detail of your needs and conditions 728 will bring literature of adaptable equip-

ment.



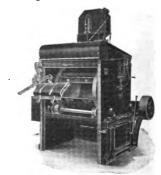
Hose Sand-Blast

Hose Sand-Blast: The Standard Direct Pressure Sand-Blast and the most effective of the various designs and types of Sand-Blast Equipment. Will do work possible with any type of sand-blast. It is particularly adapted to large pieces or extensive surfaces and work of a varied character. Made in several sizes and designs for installing either on the floor level, or in pit below the floor for continuous gravity feed. Also open hopper types for limited demands.



Cabinet Sand-Blast

Cabinet Sand-Blast: A self-contained Sand-Blast Machine of the continuous feed, suction type, occupying small space. It represents a complete Sand-Blast device at lowest first cost—designed for small pieces, light work or small volume, heat treated parts, "matte" finishing, frosting glass, etc., made in other designs and sizes.



Barrel Sand-Blast

Barrel Sand-Blast: The most rapid and economical method of cleaning quantity production work too small for individual handling—Gravity feed, full value of air pressure. Self-contained, continuous feed, substantially built, requires no pit or foundation.

Will take pieces up to limit of door opening. Made in three sizes. Also in other types for smaller work.

PANGBORN CORPORATION

PANGBORN SAND BLAST SPECIALISTS

Revolving Table Sand-Blast: An automatic, continuous feed, direct pressure, hygienic Sand-Blast for work of precision that would suffer from contact, fragile castings or castings, forgings, etc., of odd or cumbersome shapes not adapt-



Revolving Table Sand-Blast

able to other methods of cleaning. Work loaded and unloaded as table revolves—Blasting operation enclosed—Operator works in the open.

Made also in other types for crockery, glassware, etc.



Room Sand-Blast

Room Sand-Blast: A complete Sand-Blast Installation with direct pressure Hose Machine (structural steel room)— Abrasive falls through grated floor to conveyor and elevator. Separator eliminates coarse and fine refuse from reusable abrasive. Ventilated to ten changes of air per minute. Dust confined in Cloth Screen Arrester. Equipment outside of room—controls within.

Room can be equipped with bench, car or monorail as required. Also constructed with rotative table in wall for loading and unloading work from outside.



"EH" Hygienic Table-Cabinet

"EH" Hygienic Table-Cabinet: A hygienic, semi-automatic direct pressure Sand-Blast Installation for work up to 3' 6" largest dimension. For use with Hose Machine placed for continuous operation either on floor level or in Pit beneath the Cabinet. Pieces are loaded on the rear of rotative table, the partition of which entirely closes the Cabinet, the Operator working on the outside free from flying abrasive and dust.



Hygienic Room Sand-Blast

Hygienic Room Sand-Blast for large work. Every efficiency of the Room Sand-Blast with the Operator relieved from all contact with dust-laden air. The last word in modern sand-blast application.

Built in sizes and arrange-

Built in sizes and arrangement to individual requirements.

729

ENGINEERING

AMERICAN INSULATING MACHINERY COMPANY

ROBT. W. WITHINGTON, President

OFFICE AND WORKS

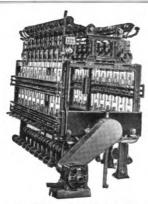
H. L. BENNER, Secretary and Treasurer

Established 1855

FAIRHILL AND HUNTINGTON STREETS, PHILADELPHIA, PENNA., U. S. A.

Incorporated 1915

Manufacturers of Insulating and Special Machinery



Double Cover, Cotton or Silk INSULATING MACHINE

730 Magnet Wire Enameling Machines.
Cotton or Silk Insulation Winding Machines.

Paper Tape Insulating Machines.
Insulated Wire Reclaiming Machines.
Twinning, Cabling and Bunching
Machines.

Wire Drawing Machines.

Measuring and Respooling Machinery.

Multiple Pull-Out Stands with Traverse.

Saturating Tank Outfits and Pull Out
Capstans.

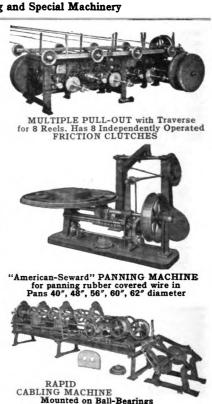
"American-Seward" Panning Machines for panning Rubber Covered Wires. Rubber Covered Wire Vulcanizing Pans. Rubber Covered Wire Patch Vulcanizers. "American" Pressed Steel Reels for wire, etc.

Power Driven Reel Stands with Traverse. Electric Railway Automatic Signals.



PHILADELPHIA USA

Special Machinery Designed or Built





ENAMELING MACHINE, Heavy Model for Wire 10 B. & S. to 20 B. & S. Gauge

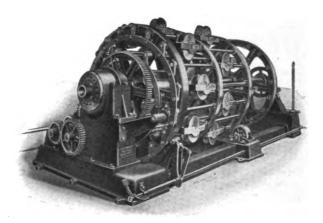
NEW ENGLAND BUTT COMPANY

PROVIDENCE, R. I.

European Agents: Selson Engineering Company, Ltd., London, England

Manufacturers of Braiding Machinery; Machinery for Insulating Wires and Cables,

also Machinery for the Manufacture of Wire Ropes and Cables



Planetary Type Cabling Machine

WIRE ROPE MACHINERY:

Full line of high speed and planetary type machines. Closing Machines for wire rope.

BRAIDING MACHINERY:

Used for making plain and fancy braids for dress trimmings and millinery, round and flat shoe laces, soutache braids, candle wicking, tapes, cords, banding, clothes lines, fish lines, packing, gas tubing and rubber hose, round and flat elastic.

Sash Cord Braiders for making solid sash and curtain cord of various sizes.

Sash Cord Finishers for polishing solid sash cord.

Rubber Spreading Machines, built of any desired width for applying a thin coating of rubber to cloth.

INSULATING MACHINERY:

Single, Double and Triple Deck Braiders:

These are made in all sizes and combinations for covering wires from small sizes up to large cables.

Annunciator Wire Winders, Single, Double or Triple Deck.

Polishing Machines, for insulated wires and cables from the small sizes up to 3" cables.

Wire Measuring Machines.

Twinning Machines.

Rubber Strip Covering Machines, for applying rubber insulation to wires and cables with either single or double seam. These machines are built in several sizes and handle from one up to twenty wires at a time.

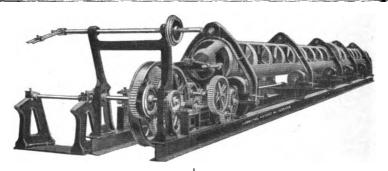
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731

NEW ENGLAND WIRE MACHINERY CO.

NEW HAVEN, CONN.

Manufacturers of Wire Stranding and Closing Machines, Insulated Cable and Wire Rope Machinery



Complete line of High Speed Wire Stranding Machines (Larmuths' Patent). These are high grade machines developed from long experience to meet the most exacting requirements, and producing a maximum output. Bobbin cradles or flyers and also the rollers supporting revolving frame are mounted on high grade ball bearings, also revolving frame and supporting rollers are carefully balanced to eliminate vibration when running at high speed.

The illustration represents type of machines having bobbins 6½" to 24" diameter, and for 3 to 19 wires. The drum stand for taking off the finished strand can be placed either at the side as shown or in front.

These machines are fitted with tight and loose pulleys or can be arranged for direct motor drive. A suitable brake for quickly stopping the machine is fitted near head end.

These machines are also furnished in tandem, having 3 and 9, 7 and 12, or 9 and 15 bobbin sections, for bobbins 61/2" to 16" diameter. They are arranged so they may be run together in tandem, the strand from the back section passing through the front section as a core; wires from the front section being laid over this core in the same or opposite direction, the strand being drawn through the

machine by the draw-off capstan or both sections may be run as separate machines; the back section as a single machine with its own draw-off capstan and take-off reel at the side, and the front section with its own draw-off capstan and drum stand either at the side or in front as may be desired. Each section of these machines have their own driving pulleys, belt shifting gear and brake, the two sections being coupled together with one back shaft which is connected by cut gears in such a manner that the shaft does not act as a driver but only to keep the two sections running in unison at their relative speeds, and so prevent one overrunning the other.

Planetary Type Wire Stranding Machines for stranding any number or combination of wires desired for wire rope or conductor cable.

Closing Machines for wire rope or conductor cable up to bobbins of 60" diameter.

Sector Conductor Stranding Machines. Rubber Strip Covering Machines.

Twinning Machines.

Bunching Machines.

Spooling or Bobbin Winding Machines. Wire Tinning Equipment.

A complete engineering corps will collaborate in the development of special machinery.

TEXTILE MACHINE WORKS

READING, PA.

Manufacturers of Braiding and Insulating Machinery

Manufacturers of

BRAIDING MACHINES

for all kinds

of technical purposes

as well as auxiliary

Machinery used in the

Braiding Industry

HIGH GRADE

GRAY IRON CASTINGS



Rubber Hose Braider

733



Measuring Machine for Wires and Cables

THE TORRINGTON MFG. CO.

Incorporated 1885

TORRINGTON, CONN., U. S. A.

Rolling Mill Machinery, Tube Drawing Machinery, Wire Drawing Apparatus, Cabling and Stranding Machinery, Special Machinery, Contract Work, Etc.

ROLLING MILL MACHINERY:

For brass, copper, aluminum, sterling and German silver, zinc, bronze, steel—or other cold rolling and finishing.

For sheets, strips or plates; also rods.

Flatteners, straighteners, coilers, slitters, shears, drying machines, scouring machines, saws, mills, stretching machines, rolls, overhauling machines, mill trucks, blockers, etc.

TUBE DRAWING MACHINERY:

For tubes and pipes of brass and copper or other ductile metals. Draw benches, straighteners, cutting-off saws, testing benches, pointers, die grinders, etc.

WIRE DRAWING MACHINERY:

For wire and rods. Bull blocks, draw benches, air hoists, threshing barrels, diestringing machines, continuous wire machines, fine wire machines, flat wire mills, trolley wire machines, rolls, straighteners, spooling machines, magnet wire machines, pointers, etc.

CABLING AND STRANDING MA-CHINERY:

For twisting or stranding individual wires into finished cables, electrical conductors and wire rope. Twisters, twinners, stranders, capstans, spoolers, takeups, take-offs, etc. Machinery for cables ranging from 2 to 91 wires.

SPECIAL MACHINERY FACILITIES:

For satisfactorily producing special machines, from design to assembly. Drafting room, pattern shop, machine shop, forge shop. Screw machine, turret lathe and grinding departments. Buildings of modern construction. Exceptional attention to accuracy and privacy. Workmanship and material guaranteed.

CONTRACT AND JOBBING WORK:

Of every description.

THE DAVIS AND FURBER MACHINE CO.

NORTH ANDOVER, MASS.

Established 1832

Manufacturers of Textile Machinery and Card Clothing for Woolen and Worsted Mills

We have been making woolen mill machinery since 1832.

Our plant is the largest in its line in the United States.

Our machines are the standard for this country, and are continually being exported.

LITERATURE:

Detailed catalogues and circulars are sent on request.

If interested in any of the list given here we should be glad to hear from you.

PRODUCTS:

Card Clothing.

Carding Machines for Woolen, Worsted, Mohair, Asbestos, Cotton Waste, Flax Waste, Jute Waste, Silk Waste and Shoddy.

Garnet Breasts.

Condensers or Rubbs.

Card Clothing Grinding Machines.

Wool Pickers.

Wool Dusters.

Spinning Mules for Wool, Shoddy, Cotton Waste, etc.

Bobbin Winders.

Perches.

Dressers or Slashers.

Beamers.

Reels.

Spoolers.

Skein Spoolers.

Skein Winders.

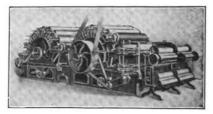
Twisters.

Chinchilla Machines.

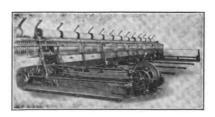
Napping Machines for Woolen, Cotton and Knit Goods.



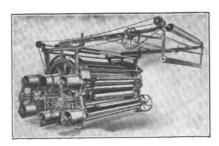
48" Fearnought Picker



60" Double Cylinder Card



360 Spindle Mule



36 Roll Napper



735

AUTOMATIC WEIGHING MACHINE CO.

MAIN OFFICES AND FACTORY

134-140 Commerce St., NEWARK, N. J.

Manufacturers of Automatic Machinery for Weighing, Packing, Sealing and Conveying Raw and Manufactured Products

APPLICATION:

Adapted to the use of manufacturers and packers of—



No. 515-A Bagging Scale 50 to 200 Lbs. 5 to 6 Sacks Per Minute

Cement

736

Sugar Coffee Spice Washing Powder Baking Powder Starch Seeds

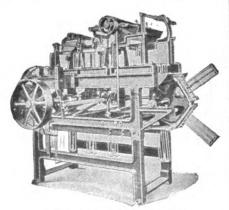
Cereals
Grains
Flours
Wheat

Rolled Oats Salt

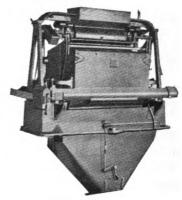
Fertilizers

Coal, etc.

Cottonseed Clay
Cottonseed Meal Limestone
Powders Rock
Chemicals Clinker
Tobacco Gypsum



Bottom Carton Sealer No. 441

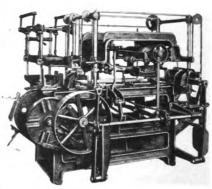


Gravity Feed Machine
Types Range from 1/4 Bu. to 6 Bu.

Other models not shown on account of lack of space.

Write for Catalog.

We maintain an Engineering Department and will be glad to discuss your Weighing Problems.



Top Carton Sealer No. 451

THE UNION ENGINEERING COMPANY

CLEVELAND, OHIO

Manufacturers of Elevating, Conveying and Confectioners' Machinery

PRODUCTS:

Power Transmission Machinery Mill Machinery Mining Machinery Mixing Machinery Paint Machinery Varnish Trucks Plaster Machinery **Excavating Machinery** Brick and Clay Working Machinery Grain Elevator Feed Mills

Direct and Steam Heat Dryers Garbage Disposal Plants Crushers

Chain Belting

Screens Coal and Ash Handling Machinery Loom Machinery Patent Mixers for Candy, Ice Cream, Paint, Etc. Patent Paper Box Sealing Machines Patent Marking and Cutting

Candy Machines Can Compressors

We design and Manufacture Special Machinery.

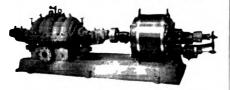
SLAT CONVEYOR:



Standard and special designs for any particular purpose.

Also belt and chain conveyors, any size or type.

DAYTON CENTRIFUGAL PUMPS:



We manufacture the "Dayton" line of turbine and volute centrifugal pumps, comprising a complete line of both horizontal, and vertical or sump pumps.

THE HAHN SEALING AND GLUING MACHINE:



For Sealing Paper Boxes Patented and Patents Pending

Capacity of the machine is from 3,000 to 5,000 boxes per day, according to speed of operator. Motor or belt drive. Does not require more than 1 H. P. to operate.

Takes boxes from 3 to 20 inches in 737 height and 22 inches wide. Adjustment from the smallest to the largest size box can be made in less than one-half minute. We can make machines for larger boxes, if required.

CAN CLOSING MACHINE:

Friction cover can closing machine, for pressing covers on friction top cans. Cap. 20 qt. cans. Adjustment 0 to 878".

Larger size made with foot operated clutch, capacity 30 qt. cans. Adjust-ment 2" to 11".

PONY PAINT MIXER:

We build a complete line of paint and candy mixing machinery.



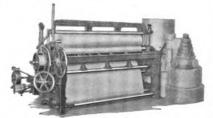


CAMERON MACHINE COMPANY

57-61 POPLAR STREET, BROOKLYN, N. Y.

Manufacturers of Camachine Slitting and Rewinding Machines for Paper, Fabric, Rubber, Tinfoil, etc.

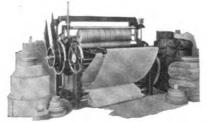
CAMACHINE NO. 6:



For slitting and rewinding paper and fabrics of all kinds

CAMACHINE NO. 6:

738



For slitting and rewinding paper and fabrics of all kinds

The Slitting Method developed by Cameron Machine Company, after years of practical experience in the manufacture of every sort of slitting and rewinding device, is known to the trade as the "Cameron Score Cutter." For many years past, the "Score Cutter" has been employed in a variety of "Cameron" special machines designed to meet a wide range of requirements. Preference for the "Score Cutter" is based on the fact that results have warranted our finally rejecting other methods in its

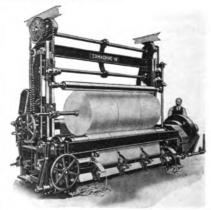
favor, as it is the speediest and smoothest means for slitting all kinds of material, including not only paper of all kinds, but also fabrics of all kinds, fibre, asbestos, celluloid, foil, compositions, etc.

CAMACHINE NO. 10, MODEL 10:



Heavy duty machine for the finishing room of Paper Mills

CAMACHINE NO. 18:



Heavy duty mill winder for work back of [paper machine

FARNHAM MANUFACTURING CO.

31-39 Indiana St., BUFFALO, NEW YORK

Manufacturers of Elevating, Conveying Machinery; Brass and Copper Mill Machinery; Trolleys, Switches, Turntables, Etc.; Paper Mill Specialties



PLAIN AND GEARED TROLLEYS

Our trolleys are constructed of steel and are very strong and durable. Wheels are large in diameter and can be ordered to fit any size I-Beam.



TWO ROLL CRUSHERS FOR COAL, COKE, ETC.



TESTING SAWS
For Testing Brass and Copper Rods.



SWITCHES, TURNTABLES AND TROLLEY SYSTEMS



FOUR ROLL CRUSHERS FOR COAL, COKE, ETC.



ROD POINTING MACHINES
For Pointing Brass and Copper Rods.

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739

THE SANDUSKY FOUNDRY & MACHINE CO.

SANDUSKY, OHIO

Manufacturers of Fluid Compressed Non-ferrous Tubing and Special Paper Mill Machinery

FLUID COMPRESSED BRONZE AND COPPER TUBES are the product of

a new patented process developed in our own bronze foundries.

The process involves the art of casting in permanent molds and compressing the metal while still in a fluid state.

The result is a casting free from blow holes, soft or 740 hard spots, shrinkage cracks or other latent imperfections. The treatment gives the metal a close homogeneous and grain, a high and uniform density throughout the tube.



The machining is done on turning and boring equipments especially designed for the purpose.

Range of Sizes: 4'' to 30'' outside diameter, wall thickness from $\frac{1}{4}''$ to $\frac{1}{2}''$, length up to 220'' depending on diameter and wall thickness.

Chemical and Physical Properties: Almost any non-ferrous composition may be furnished. A few compositions, much in demand, are:

No. I Sandusky Standard: 85% Cu, 6% Sn, 6% Zn, 3% Pb and Ni. Average ultimate tensile 40,000 lbs. per square inch. Average elongation in 2"—24%. Used for propeller shaft sleeves, liners, bushings, and roll covers. Well suited for machining and shrinking on. Excellent wearing quality.

Comp. "G" Navy Specif. 46M6a: 88% Cu, 10% Sn, 2% Zn. Average ultimate tensile 41,000 lbs. per square inch. Average elongation in 2"—32%. A tough and hard mixture for sleeves, bearings and liners.

No. 4-N Sandusky: 88% Cu, 6½% Sn, 1% Ni, 4½% Zn and Pb. A splendid hydraulic composition used where tubes must stand high external or internal pressures.

Naval Brass, Navy Specif. 46B10a: 62% Cu, 37% Zn, 1% Sn. Average tensile 52,000 lbs. per square inch.

Purposes: Fluid compressed Tubing is successfully used and by virtue of its superior quality, preferred to tubular products made by other processes for the following purposes:

Propeller Shaft Sleeves
Engraving Rolls
Bearing Liners
Roll Covers and Jackets
Bushings

Cylinder Liners for Pumps and Presses Bronze Pipes

Patterns Are Not Needed: We do not supply rough castings. For more complete treatise on the subject of Fluid Compressed Tubing send for Bulletin No. 202.

SPECIAL PULP AND PAPER MILL MACHINERY:

A few of the products made are:
Millspaugh Suction Couch Rolls and
Suction Press Rolls

Millspaugh Shower Pipes
Press and Breast Rolls covered with
Fluid Compressed Jackets

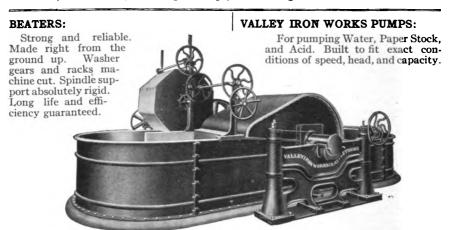
New standard equipment on all new modern Paper Machines.

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VALLEY IRON WORKS CO.

APPLETON, WIS.

Builders of Fourdrinier Machines, Cylinder Machines, Beaters, Washers, Bleachers, Deckers, Sulphur Burners, Barkers, Shredders, Chippers, Wet Machines, Acid Tanks, Blow Pits, Stuff Chests, Centrifugal Pumps, Marine Engines



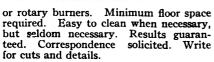
VESUVIUS SULPHUR BURNERS:

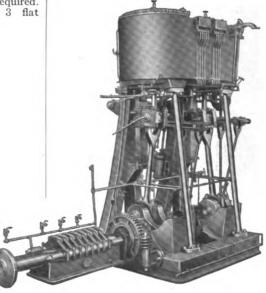
Well constructed. Strong and substantial. No power or steam required. Self-contained. Does work of 3 flat

Adapted for continuous running with high efficiency.

741¹







MARINE ENGINES:

Approved by the Emergency Fleet Corporation. Built in sizes ranging from 450 horse power up.

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THE NATIONAL SUPPLY CO.

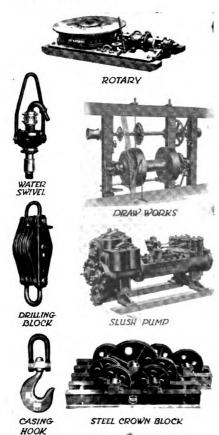
TOLEDO, OHIO

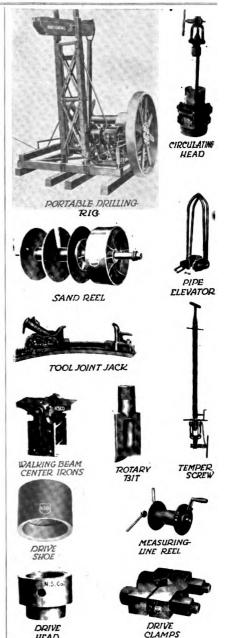
Manufacturers of Oil, Gas and Water Well Machinery, Pipe Line and Refinery Supplies of All Kinds

DRILLING EQUIPMENT:

Special Rig Irons Standard Rig Irons Iron Sand Reels Rotary Drilling Outfits Portable Drilling Rigs Mounted Drilling Machines Drilling and Fishing Tools Tool Joints Rotary Shoes and Bits Drive Shoes Circulating Heads Drive Heads Drilling and Casing Blocks Steel Crown Blocks Drive Clamps Elevators, etc., etc.

742



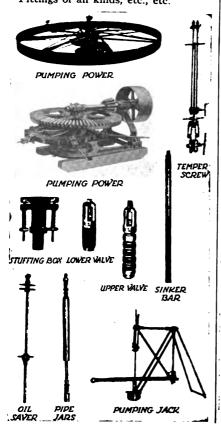


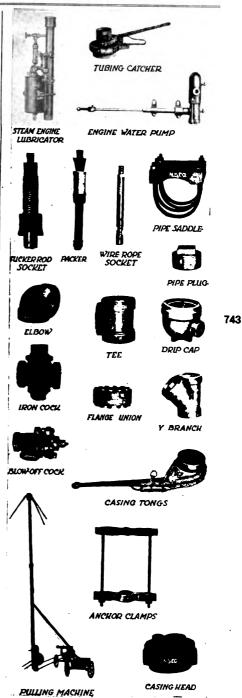
HEAD

THE NATIONAL SUPPLY CO.

PUMPING EQUIPMENT, MISCELLANEOUS SUPPLIES:

Single and Double Eccentric Band Wheel Pumping Powers Push and Pull Powers Wire Line Pumping Outfits Sucker Rods and Pull Rods Working Barrels and Valves Casing Heads Pumping Jacks Stuffing Boxes Polished Rods Engine Water Pumps Barrett Type Oil Well Jacks Well Packers Belt Tighteners and Stretchers Iron and Brass Cocks and Valves Pipe Saddles Pipe Vises Fuel Oil Burners Casing Tongs Casing Wagons Anchor and Casing Clamps Fittings of all kinds, etc., etc.





BUCKEYE IRON & BRASS WORKS

DAYTON, OHIO

Brass Goods for Engine Builders, Steam and Water Fitters

Tobacco Cutting Machinery, Linseed and Cotton Seed Oil, Mustard Seed, Sesame
Rape Seed, Peanut, Soya and Velvet Bean Machinery. Castor and

Cocoanut Oil Machinery a Specialty

BUCKEYE

Extra Heavy Iron Body Throttle Valves
For High Duty Engines

High Grade Brass Goods

Angle Valves

Blow-Off Valves

Check Valves

Cross Valves

Gate Valves

Globe Valves

Hot Water Valves

744

Radiator Valves

Steam Stops

Unions

Safety Valves

Hydraulic Valves

Ammonia Valves

Air Cocks

Cylinder Cocks

Oil Cups

Brass Lubricators

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Name Plates

Hose Fittings

Water Gauges

Brass, Bronze, Copper and Aluminum Castings

OIL MILL MACHINERY

Hydraulic Presses

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and Power Formers

Attrition Mills

Disc Hullers

Cake Breakers

Mechanical Upright Cookers,

full drop charge

Wave Line Grinding Plates

Automatic Cake Strippers

Hydraulic Power Pumps

Accumulators

Change Cocks

Brass and Steel Hydraulic Fittings

Sole Manufacturers of the Celebrated

PEASE IMPROVED

TOBACCO CUTTING MACHINES

for cutting fine cut, smoking, cigarette and piccadura tobacco.



THE BIGGS BOILER WORKS CO.

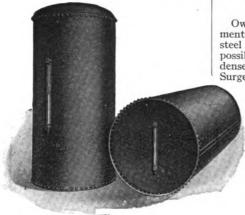
Established 1887

CASE AVE. & NEWTON ST., AKRON, OHIO

Manufacturers of Steel Storage and Pressure Tanks of Every Description, Vulcanizers, Devulcanizers, Rotary Bleaching Boilers, Steel Riveted Pipe, Light and Heavy Plate Construction

PNEUMATIC WATER SUPPLY TANKS:

Our pneumatic water supply tanks are constructed throughout of soft open hearth steel, rivets closely spaced and driven hot under hydraulic pressure, the heads being flanged and dished to a true radius of the shell. All openings 11/4" and larger are reinforced with pressed steel boiler flanges. The material and



workmanship on these tanks are first class in every respect, and the tanks are guaranteed absolutely tight under initial test pressure of 150 lbs.

Tanks are furnished in sizes from 24" x 5', 117 gallons capacity, to 9' x 40', 19,000 gallons capacity. Standard sizes are carried in stock for immediate shipment.

Write for our Price List "F" covering our complete line of Pneumatic Water Supply Tanks, Air Receivers and Hot Water Supply Tanks.

HIGH PRESSURE TANKS:

The illustration at the top of the second column shows one of our heavy duty tanks designed for a working pressure of 500 lbs. per square inch, shell plates 1½" in thickness and the rivets 1 16 in. diameter. The longitudinal seams are butt joint, quadruple staggered riveted with inside and outside covering straps. These tanks are largely used for gasoline reduction.

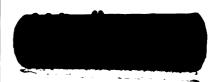


Owing to complete hydraulic equipment, we are prepared to furnish steel tank and plate work of the heaviest possible description, including Con-densers, Evaporators, Filter Tanks, densers, Evaporators, Surge Tanks, etc., etc.

OIL AND GASOLINE STORAGE TANKS:

Our oil and gasoline storage tanks are constructed throughout 745 of soft open hearth steel, rivets closely spaced and driven hot under hydraulic pressure. The heads of our storage tanks are flanged and dished to a true radius of the diameter the same on the pressure tanks,

and each tank is thoroughly tested upon completion and guaranteed absolutely tight. Tanks are designed in accordance with Underwriter's specifications, and Underwriter's labels will be attached if so desired.



Tanks are furnished from 84 gallons capacity to 25,000 gallons. Standard sizes in stock for immediate shipment.

Write for Price List No. 25 and 30.

VULCANIZERS AND DEVULCANIZERS FOR THE RUBBER TRADE.

GLOBE AND CYLINDER ROTARY BLEACHING BOILERS FOR THE PAPER TRADE.

Write for catalogues.

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CONNERY & COMPANY, INC.

2ND AND LUZERNE STS., PHILADELPHIA, PA.

NEW YORK OFFICE, 52 Vanderbilt Ave.

Manufacturers and Erectors of Steel Plate Work of Every Description Including Steel Stacks, Stand Pipes, Boiler Breechings, Coal and Ash Hoppers, Tanks of Any Kind, Tar and Asphalt Kettles



The reproduc-

tions shown,
while of a character familiar to
all engineers and
about which
little or no information need
746 be given, are
typical of the
general character

Coal Hopper Manufactured and Erected for the Public Service Electric Co., Newark, N. J. Heavy Plate Work 1/2" to 3/4" Material

and wide range of work handled by this company. We are equipped to fabricate and erect steel plate work of any description from \(\frac{1}{16}\)" to 1" in thickness.

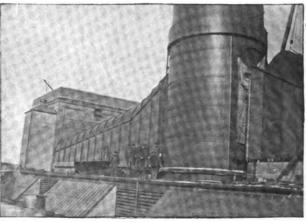
Particular attention given to the most

difficult construction.

Send us your plans and specifications or quotations or request for information or assistance in connection with work in our line.



Self-Supporting Steel Stack Manufactured and Erected for the Ehret Magnesia Mfg. Co., Port Kennedy, Pa.



One of six sets of smoke flues, uptakes and air duct manufactured and erected at Buffalo General Electric Co., Buffalo, N. Y.
Stone & Webster, Inc., Engineers

FARRAR & TREFTS, INC.

ESTABLISHED 1864

INCORPORATED 1911

BUFFALO, N. Y.

Engineers, Iron Founders, Machinists, Boiler Makers, Tank Builders, Pattern Makers, Heavy Iron Castings, Steel Plate Work

STEEL PLATE WORK:

Boilers, Stacks, Tanks and other welded or riveted steel plate construction, flanged and dished heads.



Steam Chest

Our Tank and Boiler Shops are equipped with up-to-date tools and machinery suitable for carrying out the ideas of Engineers. Difficult plate and tube work carefully executed from your drawings and specifications. Special machinery built to order.

CHEMICAL APPARATUS:

Dryers, Stills, Evaporators, Kettles, Filter Presses, Vats, Mixers, Jacketed Tanks for steam, oil or water.

MACHINE WORK:

Patterns, Forgings, Blacksmithing and Welding, either Acetylene or Electric.

We will build from your designs.

CASTINGS:

Grey Iron, Semi-steel, Acid Resistant, Municipal and Grate Bars. Single castings from one pound to fifty tons for shipyards, railroads, engine builders and machinery manufacturers.



Caustic Pot

747



Valve Body

In connection with our modern Foundry we are prepared to furnish all material necessary for the completion of your work.

Heavy Iron Castings furnished from customers' patterns.

Capacity 150 tons per day. Single castings up to 50 tons.

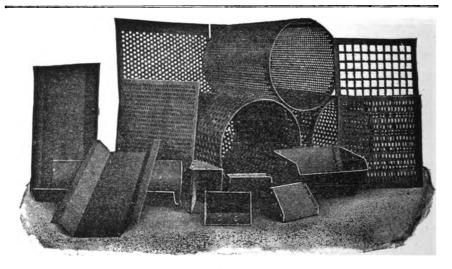
Estimates furnished.

HENDRICK MANUFACTURING CO.

CARBONDALE, PENNA.

NEW YORK OFFICE: 30 CHURCH ST.

Manufacturers of Perforated Metal Screens, Elevator Buckets, Conveyor Flights and Trough, Stacks, Tanks, Hoppers, Elevator Casings, General Sheet and Light Structural Work



748

"HENDRICK" PERFORATED METAL SCREENS:

In steel, bronze, copper, brass, lead and other metals for coal, coke, stone, ore and other materials requiring screening and cleaning.

Exclusive Manufacturers of The Patent Flanged Lip Screen: Used for screening coal and coke. The growing number of users may be taken as an evidence of its efficiency. Fully described in our catalog which we shall be pleased to send you.

In Our Plate Department we build elevating and conveying equipment such as Elevator Buckets (plain and perforated), Conveyor Trough and Flights, also Pans for Scraper and Apron Conveyors, Picking Tables and Loading Booms.

In Our General Sheet and Structural Steel Department we make sheet steel work of every description, including Tanks, Hoppers, Coal and Ash Bunkers, Stacks, Smoke Flues, Elevator and Conveyor Casings, Screen Cases and General Sheet and Plate Pipe Construction. We are also prepared to fabricate Light Structural Steel Work, Chutes and Loading Booms for Tipples, Steel Truck Bodies, Mine Cars, Mine-Car Parts, Coal and Ash Conveying Lines and Heavy Buckets for the handling of ore and other materials.

We would be pleased to receive your orders or inquiries.

WRITE FOR
PERFORATED METAL
HAND BOOK



THE LASKER IRON WORKS

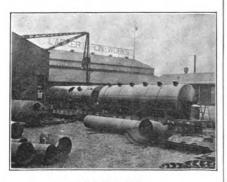
3201 SOUTH LINCOLN STREET, CHICAGO, ILL.

Telephone McKinley 3700

Engineers—Fabricators—Erectors
Steel Plate Construction



Gasoline Agitator Dome



Gasoline Stills



Rolling Capacity 32'-0"
I" Plate to 72" Diam.

BUILDERS OF STANDARD STEEL PRODUCTS:

Lasker products are based on twenty years' intensive experience, plus modern equipment. On this firm foundation we have built our name and reputation. The maintenance of these things necessitates that they be protected and extended with every order filled.

Customers are saved annoyance, delays, worry and money through this source. It means that the installation of the sturdy, economical Lasker Steel Products brings results in service, economy and satisfaction.

LASKER SERVICE:

We are prepared to erect special steel plate work of any kind wherever you may be located. As engineers, fabricators, and erectors, we specialize in steel plate construction for smelters, steel rolling mills, and oil refinery equipment. Also hydraulic power plants, acid and chemical plants, packing houses, soap works, power plants and the making of tanks for any storage use. The scope of our operations on work of this nature, covering as they do practically the whole United States, makes our service available to concerns everywhere who appreciate quality. Large stocks permit prompt action.

PRICES ON REQUEST:

On receipt of specification, covering your needs, we will immediately prepare and submit quotation which will prove the economy of Lasker methods and efficiency.

749

LANCASTER IRON WORKS, INC.

MAIN OFFICE AND WORKS

New York Office 501 Fifth Ave. Cor. 42nd St. 540 PRINCE ST. LANCASTER, PA.

Boston Office Broad Exchange Bldg., 88 Broad St.

THE LANCASTER IRON WORKS, INC. is located at Lancaster, Pa., on two railroads—the Pennsylvania and the Philadelphia & Reading.

We carry a big stock of plates from $\frac{3}{16}$ to $\frac{3}{4}$.

We have on hand a large supply of flat and of flanged and dished heads.

We operate our own ERECTING GANGS, and are prepared to erect work anywhere in the United States or Canada.

Our principal business is fabricating steel plate into Tanks—Riveted Steel Pipe—Stacks and Breechings—Standpipes, etc.

We are particularly well equipped to handle Steel Plate Construction where there are Castings and Machine Work in connection with it, because:

We maintain FOUR SHOPS—PLATE SHOP, MACHINE SHOP, FOUNDRY AND PATTERN SHOP.

Our idea is that when we control all the sources of manufacture in connection with the work we do, we are in a position to know at all times the condition and progress of the work. We can feel sure that the work will be done right by our own men. We are not dependent on outside sources, and when we do all the work ourselves in our own shops, we can be RESPONSIBLE for the MATERIAL, the WORKMANSHIP and the PROMISE OF DELIVERY.

TANKS:

Acid

Pressure

Horizontal Oil Storage

Jacketed

Mixing Tanks

Pneumatic Tanks

Large Oil Storage Tanks

Steel

Paint and Varnish

STEEL PLATE CONSTRUCTION

STANDPIPES

STACKS-STEEL

BREECHINGS-SMOKE

RECEIVERS—AIR

BRICK-MAKING MACHINERY

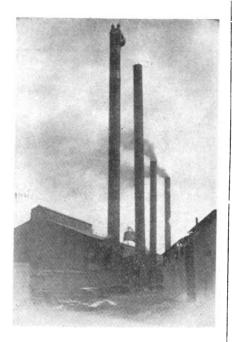
CLAY WORKING MACHINERY

ROTARY DRYERS

PIPE—DREDGE

PIPE-RIVETED

LANCASTER IRON WORKS



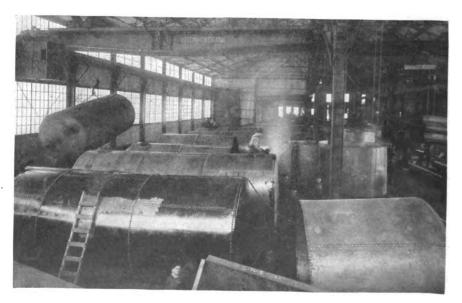
Stacks 78" x 150" Ft. High



Large Oil Storage Tank



Dredge Pipe



Testing and Loading Bay

RIVERSIDE BOILER WORKS, INC.

Established 1888

CAMBRIDGE, MASS.

NEW YORK TRENTON

CHICAGO JACKSONVILLE BOSTON

MONTREAL SAN FRANCISCO

NEW ORLEANS SALT LAKE CITY

Manufacturers of Steel Tanks

TANKS MANUFACTURED:

Cylindrical Steel Tanks from 5 gals. to 2260 gals. capacity, with diameters ranging from 6 ins. to 48 ins. inclusive.

Pressure Tanks, for water or air, for all working pressures up to 200 lbs. inclusive.

Riveted and Brazed Tanks from 6 ins. diameter to 48 ins. diameter x 24 ft. long.

Welded Tanks from 6 ins. diameter to 48 ins. diameter x 24 ft. long inclusive.

Galvanized Tanks from 6 ins. diameter up to tanks 30 ins. diameter x 12 ft. long. 752 Hot-dip process used.

> Tanks made of stock varying from 14 gauge ($\frac{5}{64}$ in.) to 3 gauge ($\frac{1}{4}$ in.), with dished or flat heads from 14 gauge (54 in.) to 3/8 in. inclusive.

> Rectangular or odd-shaped tanks, riveted or welded, from $\frac{1}{64}$ in. to $\frac{1}{4}$ in. thickness inclusive, black or galvanized.

> Kitchen Range Boilers, galvanized steel, riveted and brazed, in capacities from 12 gals. to 194 gals. inclusive, sizes from 10 ins. diameter x 3 ft. to 24 ins. diameter x 8 ft. Special designs in "Kopsteel" and "Armco Iron."

> Expansion Tanks, galvanized steel, riveted and brazed, in capacities from 5 gals. to 120 gals. inclusive, sizes from 10 ins. diameter x 16 ins. long to 24 ins. diameter x 60 ins. long.

Barbers' Boilers, galvanized steel.

Hot water Storage Tanks, black or galvanized, with or without iron, brass or copper coils.

Pneumatic Water Supply Tanks, black or galvanized.

Air Tanks for fresh water supply systems.

Cistern Tanks.

Gasoline Storage Tanks.

Water Storage Tanks.

Fuel Oil Tanks.

Compressed Air Tanks.

Lubricating Oil Tanks.

Whistle Tanks.

Brine Tanks.

Rectangular Tanks to fit any location on shipboard.

Gasoline Storage Tanks.

Air Tanks for Garages.

Tanks for Chemical Manufacturers.

Compressed Air Tanks for all uses.

Tanks for use as floats.

Tanks for use with elevator installations.

Tanks for drinking fountains.

Buovs.

Steel Sinks, black or galvanized.

Air Tanks for spraying outfits.

Air Tanks for paint-gun use.



WELDED HEADERS A SPECIALTY:

GALVANIZED STEEL WELDED HEADERS are far ahead of the castiron type. Built for high pressures.

WM. B. SCAIFE & SONS CO.

Founded 1802

OAKMONT, PA.

PITTSBURGH OFFICE First Nat'l, Bank Bldg.

NEW YORK OFFICE 26 Cortlandt St.

CHICAGO OFFICE First Nat'l. Bank Bldg.

Manufacturers of Scaife Copper-Brazed Pressure Tanks

BRAZED TANKS:

These tanks can be furnished of any diameter between 6" and 48", with one or both heads concave or convex.



Plate H-8

Our exclusive process of copper-brazing seams or joints makes parts these actually stronger than the remainder of the tanks. The brazing material so thoroughly unites itself with the steel, filling the minute interstices. that the tank has the strength of one continuous piece of metal. This copper-brazing process has been used by us exclusively for nearly

We positively guarantee fifty years. these tanks to hold air indefinitely without loss of pressure.

Plates H-3 and H-4 are taken from actual photographs of a copper-brazed tank which we purposely tested to destruction. Notice the distorted shape of the bursted tank and the splendid condition of all the brazed parts, conclusively proving that they are stronger than the original material.



This tank was 12" diameter, shell $\frac{7}{64}$ ", head $\frac{3}{16}$ "; tensile strength of the steel, about 58,000 lbs. The tear in the shell occurred when the applied pressure reached 1,035 lbs. per sq. in.; all the brazed joints remaining intact.

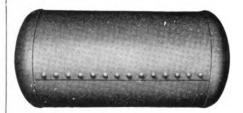


Plate H-3

Similar tests have been made frequently by entirely disinterested tank experts with the same results as in this case.

No other manufacturer furnishes copperbrazed tanks, although occasional attempts are made to create this impression in the public mind. Soft-soldering

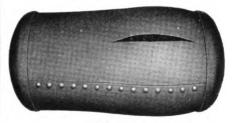


Plate H-4

and other so-called "brazing" methods must not be mistaken for copper-brazing. Hundreds of our brazed tanks made over twenty years ago are still in service. The copper coating around the seams protects these parts from corrosion.

Brazed Pressure Tanks for All Pur-

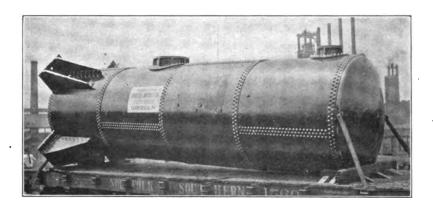
Also Welded or Riveted Tanks, Plain or Galvanized, for All Purposes.

(See page 157 for additional products of this Company)

SHARPSVILLE BOILER WORKS CO.

SHARPSVILLE, PA.

Fabricators of Steel Plate Work of Every Description



Established 1860, the Sharpsville Boiler Works Co., are pioneers in the designing, fabricating and erecting of steel plate construction of every description for the steel, oil, chemical and allied industries.

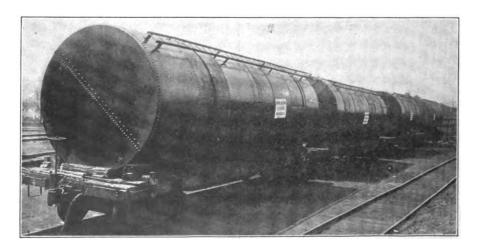
Shops designed along the most modern lines, the latest improved machinery, up-to-date handling facilities, our experience of over fifty years and our location on four of the largest railroads, viz., Pennsylvania Lines, New York Central,

Erie and Baltimore & Ohio, places this organization in excellent position to render prompt and efficient service.

STORAGE TANKS:

For years we have specialized on storage tanks, Vertical and Horizontal—all sizes for all purposes. We have standard designs of all capacities and carry in stock at all times 5,000 to 24,000 gallon Vertical and Horizontal type.

"When You Think of Plate Work
Think of Sharpsville"



THE WARREN CITY TANK AND BOILER CO.

GRISWOLD STREET, WARREN, OHIO

Manufacturer of Tanks, Any Size, Any Purpose, Erected Anywhere



The Warren City Tank & Boiler Company solicit contracts for everything of steel that goes into your Refineries. We contract to furnish the steel and ship the fabricated product for the purchaser to erect himself or we will undertake the complete design and erection of the Refinery. We know every angle of the business of Refineries and can give you the benefit of our consulting service in planning a first class plant.

Almost every one in the Petroleum Industry knows how Warren City stands on Steel Tanks which are made in any capacity, erected anywhere, and for any purpose. We can make prompt de-

livery on 37,500 and 55,000 gallon tanks as we carry these in stock.

We can also furnish you prompt delivery on:

. Çylinder tanks

Stills

Agitators

Condensers

Car tanks

Stand pipes

Smoke stacks

Grease kettles

Annealing boxes

Write or wire for quotations.

THE H. B. SMITH CO.

WORKS: WESTFIELD, MASS.

WESTFIELD, MASS.: 57 Main Street

NEW YORK: 10 E. 39th Street Boston: 138 Washington Street, North

Рицарила: 17th and Arch Streets

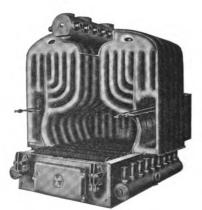
Manufacturers of Boilers and Radiators for Steam and Water Heating

MILLS WATER TUBE SECTIONAL BOILERS:

A. S. M. E. Standard



No. 44 Mills Steam Boiler



No. 44 Mills Boiler-Interior

H-B BOILERS:



COMMERCIAL RATINGS

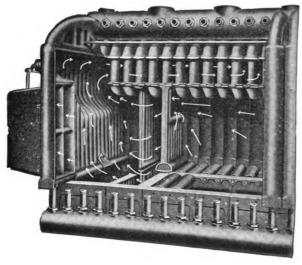
Diam.	Steam	Water
of Fire Pot Inches	Rating Feet	Rating Feet
15 to	250 to	425 to
27	1000	1650

MILLS WATER TUBE BOILER

Size of Boiler	Nominal Width Fire Pot	Commercial Rating Capacity in Sq. Ft.		
		Steam	Water	
No. 24	24"	900 to 2025	1500 to 3350	
No. 34	34"	2000 to 5200	3300 to 8575	
No. 44	44"	3600 to 9000	5950 to 14850	
No. 48	48"	4800 to 12000	7925 to 19800	

Send for bulletins and catalogues giving complete information.

THE H. B. SMITH CO.







No. 60 Smith Boiler with Smokeless Furnace

Smith Service Boiler W-17

SMITH SECTIONAL BOILERS:

With or without Smokeless Furnace for Bituminous Coals

STEAM

Size of	Width	Rating Feet of Radiation	
	Fire	Without Smokeless Furnace	With Smokeless Furnace
No. 27	27"	1200-3900	1500-2900
No. 36	36"	2300-6800	2750-5400
No. 60	60"	6000-18000	6600-15600

WATER

	Width	Rating Feet of Radiation	
Size of Boiler	of Fire Pot	Without Smokeless Furnace	With Smokeless Furnace
No. 27	27"	1975-6425	2475-4775
No. 36	36"	3800-11225	4550-8900
No. 60	60"	9900-29700	10900-25750

Catalogs, bulletins and performance data of boilers will be sent upon request. Send for Catalog No. 1146.

SMITH SERVICE BOILER W-17:

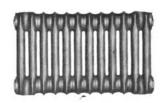
For Hot Water Supply

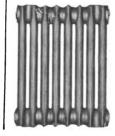
A. S. M. E. Standard.

Maximum Allowable Working Pressure 160 lbs. Open Tank; 80 lbs. Closed Tank.

PRINCESS DIRECT RADIATORS:

For Steam or Water Heating





Made in single, two, three, five column and wall radiators.

Send for Radiator Catalogue No. 1010.

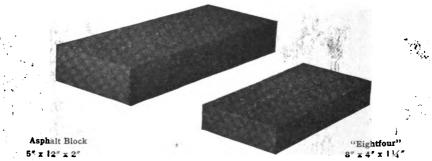
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757

THE HASTINGS PAVEMENT CO.

EXECUTIVE OFFICES: 25 BROAD STREET, NEW YORK PLANT: HASTINGS-ON-HUDSON, N. Y.

Manufacturers of Compressed Asphalt Flooring and Paving Blocks and Tiles



COMPRESSED ASPHALT FLOORING AND PAVING BLOCKS

ASPHALT BLOCKS:

A scientifically manufactured material for the wearing surface of streets and roads, and of piers, warehouses, loading platforms, bridges, factory floors, driveways, courtyards, etc.

Manufactured at a large permanent plant; shipped in block form ready to lay; and always obtainable in any quantity for extension and repairs.

COMPOSITION:

A properly proportioned mixture of natural asphalt, crushed rock and limestone dust is heated to 300 degrees Fahr.. and shaped into uniform blocks under a pressure of 6000 lbs. per sq. in.

SIZE AND WEIGHT:

The blocks are 5 ins. wide, 12 ins. long, and 2 and $2\frac{1}{2}$ ins. deep, and weigh, respectively, 11 and $13\frac{1}{2}$ lbs. A square foot of 2 in. block weighs 26 lbs. The "Eightfour" blocks are 8 ins. long, 4 ins. wide and $1\frac{1}{4}$ ins. deep and weigh $3\frac{1}{2}$ lbs. A square foot of $1\frac{1}{4}$ in. "Eightfour" weighs $15\frac{1}{2}$ lbs. The specific gravity of Asphalt Block is 2.40. Blocks of other thicknesses can be made to meet special conditions.

ADVANTAGES:

Asphalt Blocks are pleasing in appearance, smooth, noiseless, dustless, warm and easy under foot, sanitary because non-absorbent, and next to granite the most durable. They present a gritty, non-slippery, non-skidable surface and are easily taken up and relaid. They are non-expansive, odorless and free from exudations, and are not affected by standing loads, extremes of temperature, or by automobile oils. They are reasonable in cost, and are made to suit any climate and traffic conditions.

"EIGHTFOUR:"

The "Eightfour" Asphalt Flooring Block is designed especially to meet those conditions in which weight and thickness of flooring must be at a minimum consistent with durability under heavy traffic. The "Eightfours" are laid in the same manner as the large blocks, except that the joints are grouted.

For roofs subject to traffic, an "Eightfour" is manufactured 1 in. in thickness, which weighs 121/2 lbs. per sq. ft.

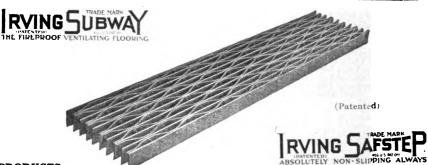
ASPHALT TILES:

A wearing surface especially designed for cemetery and park walks, sidewalks, and other surfaces, subject to foot traffic.

IRVING IRON WORKS COMPANY

THIRD STREET AND DUTCHKILL CREEK LONG ISLAND CITY, NEW YORK, U. S. A.

Telephone, Hunters Point 3342



PRODUCTS:

Sole manufacturers of Irving "Subway," the fireproof ventilating grating-flooring; Irving "Safstep," the non-slipping safety stair or ladder step; "Reticuline," "Eggcrate," and "Honeycomb" grating-flooring; other forms of grating-flooring and related products; metal accessories for power plants, lighting plants, dyehouses, chemical plants, industrial plants, steamships; sidewalk doors, elevator gratings.

TRADE MARKS:

The trade marks "Subway," "Reticuline," "Sunway" and "Safstep" are registered in the U. S. Patent Office, are the exclusive property of the Company, and company the locally used in and cannot be legally used in connection with any grating-flooring products of any other manufacturer.

SCOPE OF USE:

Irving "Subway" is a perfect fireproof ventilating flooring or grating-flooring, the exclusive advantages of which recommend it preëminently for such purposes as are here suggested in all of which actual service has proved its superlative merit.

Power plant floors, galleries, walkways and stairs.

Turbine pits Pump platforms Pipe trenches and sump covers Storage rack shelving

Gas-house floors Floors and walkways Retort houses Charging floors Still houses Register openings

Replacing water-cooled plates Elevator and hatchway gratings Ventilation shaft covers Stair and ladder steps

Drying oven floors Window guards Surface armoring or protection for concrete floors and platforms.

ADVANTAGES:

Irving "Subway," load for load and span for span, is the lightest gratingflooring made, and provides the maximum strength with the minimum addition to dead loads. Its construction gives a complete distribution of load over the full panel area.

Its surface is absolutely non-slipping under all conditions, and is safe and comfortable to walk upon. Wheeled trucks or rib-hooped barrels can be rolled over it in any direction without spreading the bars or going through.

It gives the maximum lighting and ventilation area, yet its individual openings are so small that only the smallest objects can pass through.

Its construction is strong, rigid and permanent. It cannot become loose and "rattley." Its appearance harmonizes with any surroundings.

Ordinary holes for pipes, columns, etc., can be cut out without additional framing or it can be built to fit irregular spaces. The structure of the flooring gives suffi-

cient strength to carry the load. IRVING ENGINEERING SERVICE:

The Company's wide experience in applying Irving "Subway" for all purposes is available to all interested, without charge or obligation. Estimates will be furnished promptly, on receipt of rough sketch of lay-out, with spans and loads.

CATALOGUE:

Catalogue 3A3, sent on request, gives complete description of Irving "Subway" grating-flooring and "Safstep" stair or ladder steps, with specifications, tests, and loads and deflections for all standard sections.

BENJAMIN ELECTRIC MFG. CO.

NEW YORK 243-247 W. 17th Street CHICAGO 806 Washington Boulevard SAN FRANCISCO 580-582 Howard Street

BENJAMIN

Benjamin Industrial Lighting
Weatherproof Lighting Apparatus
Gas and Vapor Proof Lighting Units
Store and Office Lighting Fixtures
Marine Lighting and Signal Apparatus
Porcelain Enameled Reflectors and Specialties
Two-Way Plugs
Wiring Devices
Electrical Specialties
Industrial Signals
Panel Boards and Cabinets
Punch-Press Efficiency and Safety Devices
Castings in Aluminum, Brass and Alloys
Drawings, Stampings and Spinnings in Sheet
Metal
Consulting and Engineering Service



Dome (R. L. M.) Standard Reflector Socket

760



Elliptical Angle Reflector



Deep Bowl Shade Holder Reflector

Write for our Catalogs and Bulletins





Benco Socket





Watertight Bell and Push Button



Industrial Signal



Dead Front Panel Board

The following pages were received too late for location in the proper division of the volume pertaining to similiar equipment:

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Power Plant Equipment

Tide Water Oil Co.....pp. 762, 763

TIDE WATER OIL COMPANY

11 Broadway, NEW YORK

Manufacturers of Petroleum Derivatives



The Tide Water trademark has a recognized value all over the world

LUBRICATING OILS:

The production of high grade oils and greases is of considerable importance when it is considered that in higher costs

762 of established units and other newer adoptions, the lubricant to be applied should be of the best. Specialization—with a one source crude followed by a careful refining process, stabilizes brands for value and test, and is of certain assurance to the purchaser and of most satisfying procedure for the operator.

The Tide Water Oil Company is particularly fortunate in the location of its crude sources and refinery at tide water as also in its pipe line for the transportation of its fluid material. Many years of producing refined oils and the knowledge obtained in their distribution for the many and varied technical frictional difficulties to be overcome, has placed the company in a position to most accurately meet all requirements.

Dependability of goods as well as unfailing source of supply, is a most desirable factor, especially in these days when the sources of supplies are so scattered and when the item sought for becomes a matter of difficulty to secure. Therefore, supply and demand are fully met with and to a most satisfying degree for those who are seeking proper lubricants.

Brands or values have not been enumerated here any other than to state that if its derivative is from crude petroleum, the Tide Water Oil Company has it.

The marketing of its lubricants is through a separate department, known as the Tide Water Oil Sales Corporation.

LUBRICANTS AND OTHER PRODUCTS:

Cylinder oils Miscellaneous greases
Engine oils Petrolatum
Turbine oils Gas oil
Machine oils Paraffine wax
Marine oils Petroleum coke
White oils Pitch

TIDE WATER OIL COMPANY

11 BROADWAY, NEW YORK

Manufacturers of Petroleum Derivatives



The Veedol can is of a distinctive design that is both striking and attractive. It is black with orange lettering making a strong display.

VEEDOL OIL AND GREASES:

Leading high grade lubricants for gas engines. Made in special grades for every purpose. Veedol lubricants resist heat.

KEROSENE:

Snowflake, water white, 150°

Chester, standard white, 130°

Stella, standard white, 110°

KEEPING 150 PRODUCTS UP TO SCIENTIFIC STANDARDS:

Tide Water capabilities are illustrated by the fact that at the Bayonne plant 15,000-20,000 barrels of crude oil are received daily. 1,814 miles of pipe line in the Pennsylvania fields gather crude for the Tide Water trunk lines across the mountains. 500 steel tanks with an aggregate capacity of 1,500,000 barrels are used for storage.

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Unequalled shipping and packing facilities have been provided. Private docks accommodate sea-going vessels. The Company owns its tank cars and bulk lighters. The barrel factory turns out 3,000 barrels daily; the can factory 36,000 five-gallon cans daily; the box factory 18,000 boxes.

Each of the 150 products of the Tide Water Oil Company is the best that choice of raw material, years of experience and scientific research can produce.

Mechanical Equipment Directory

IN this, its fifth issue as a reference feature of the volume of A. S. M. E. CONDENSED CATALOGUES. the general Mechanical Equipment Directory shows a further gain in scope and comprehensiveness.

Wherever the omission of appropriate subject headings has been noted in this office, or called to the attention of the Society by members or others, these have been added. At the same time every effort has been made to secure and include the names of the greatest possible number of eligible manufacturers, with the result that in this volume the Directory contains the names and addresses of more than 4000 firms, listed under upward of 3000 classifications of equipment.

Owing to the considerable extra cost of compiling and publishing the Directory, it was found necessary, as in the previous issues, to limit the free listings for non-space users to three subject headings for each firm, additional listings being procurable at the rate of three dollars each. Firms using space for publication of their data in the Catalogue Section of the volume are entitled to full listing of their products in the Directory without additional charge, with the firm name printed in capital type and followed by the page numbers of their Catalogue data.

The Mechanical Equipment Directory is especially designed to meet the ready-reference needs of mechanical engineers and others requiring a highly specialized list of this description. It is believed that the Directory will prove invaluable for this purpose, and also as a guide to and background for the more detailed information presented in the Catalogue Section of the volume.

See next page for directions

DIRECTORY SECTION

PART I

Pages 765-978

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Directions For Using Directory

Basis of Classification

In general, the policy followed is to index equipment under its most common and accepted name, using the main noun as the key index word. On that basis such equipment as Steam Engines, Oil Engines, etc., will be found indexed as ENGINES—Steam, ENGINES—Oil, etc. Exceptions to this arrangement occur where equipment, by usage or association, is best described by a complete phrase. These will be found indexed under the first word of the group. Examples of equipment listed in this manner are, DRILL HEADS, OIL CUPS and all Apparatus, Outfits, Machines, Machinery, Systems, etc.

Cross Reference

In cases where the equipment is equally well known under two names, or where it has been deemed advisable, firms making such equipment have all been listed under one subject heading and a cross reference inserted under the other heading or headings. Amplifying this system, various class or group names have been inserted, giving directions to see specific headings under which that equipment can be found. For example, under APPARATUS, directions are given to see "Acetylene," "Gas Analysis," etc., and under MACHINES to see "Drilling," "Grinding," "Slitting," etc.

Trade Names

As an additional aid in locating particular equipment, trade names have been included. These will be found following immediately after the firm name and are enclosed in quotation marks and parenthesis, thus ("Acme").

Catalogue Index

The recommendation is earnestly made that the Directory be used in conjunction with the Catalogue pages, as much valuable information can be found concerning products if reference is made to the pages whose numbers are given after the firm names.

MECHANICAL EQUIPMENT DIRECTORY

ABRASIVE MATERIALS
Abrasive Co., Bridesburg, Philadelphia, Pa.
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*CLOVER MFG. CO., 903 Main St., Norwalk, AERIAL TRAMWAYS (See Tramways, Wire Rope) AGITATORS

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AIR LIFT PUMPING SYSTEMS
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Gas Analysis Gas, Fuel

Ignition Impregnating

Hydrogen and Oxygen Hydrogen Testing

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Green Engineering Co., E. Chicago, Ind.
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American Arch Co., McCormick Bldg., Chicago,

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—Water (For Boilers) Lamprey Co., 285 Elm St., Westfield, Mass. ASBESTOS PRODUCTS

ACME Asbestos Covering & Supply Co., 1302
Fulton St., Chicago, Ill.

Anchor Packing Co., 7th & Filbert Sts., Philadelphia, Pa.

Asbestos & Rubber Works of America, (Inc.), 1821 Broadway, New York, N. Y.

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Townsend, H. P. Mfg. Co., Hartford, Conn.
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Garland, M. Co., Bay City, Mich
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Kraeuter & Co. (Inc.), 585 18th Ave., Newark,

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Moseberg, Frank Co., Attleboro, Mass.
Page-Storms Drop Forge Co., Chicopee, Mass.
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ZINC Hazel Atlas Glass Co., Wheeling, W. Va. -Electrolytic S. Smelting Refining & Mining Co., 129 Broadway, New York.

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Consulting Engineers' Directory

IN this, its fourth issue as a reference feature of the volume of A. S. M. E. Condensed Catalogues, the Consulting Engineers' Directory shows a considerable gain in scope and comprehensiveness.

Continuing the policy of previous years the Directory is compiled from returns received from the members of The American Society of Mechanical Engineers. Such omissions as may be noted are due in most cases to failure on the part of members to furnish the information desired.

Every effort has been made to secure and include the names of the greatest possible number of consulting engineers with the result that in this volume the Directory contains the names and addresses of 800 engineers listed under upward of 500 classifications.

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PART II

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CONSULTING ENGINEERS' DIRECTORY

Compiled from returns received from the membership of The American Society of Mechanical Engineers

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C

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Berusted, B. B., 908 Insurance Exchange Bidg., San Francisco, Cal.

Bixby, William H., 1709 Lanier Place, N. W., Washington, D. C.

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Brounell, Louis M., 33 West 42nd St., New Brounell, Louis M., 33 West 42nd St., New York City Churchill, W. L., 103 Park Ave., New York Cooley-Marvin Co., 15 Ashburton Place, Bos-ton, Mass ton, Mass
Emerson, Harrington, 125 Riverside Drive,
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Ingham, Howard M., 140 Nassau St., New
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Kidder, Walter M., 143 W. 82nd St., New
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Shepard, George H., Purdue University, La
Fayette, Ind.
ELECTRICAL
Adams, C. A., 33 W. 39th St., New York, N. Y.

Allen, Henry A., Room No. 23, No. 154 West Randolph St., Chicago, Ill. Allison, James E. & Co., Security Bldg., St. Louis, Mo. Almert, Harold, 209 S. La Salle St., Chicago, Ill. Arnold Co., 105 S. La Salle St., Chicago, Ill Baehr, William A., Peoples Gas Bldg., Chicago, III. Ballinger & Perrot, 329 S. Broad St., Philadelphia, Pa.
Behrend, Bernard A., 200 Devonshire St., Bos-Behrend. Bernard A., 200 Devonshire St., Boston, Mass.
Brown & Co., Edward C., 220 Devonshire St., Boston, Mass.
Camp, Eugene V., Box 421, Atlanta, Ga.
Cory, Russell G., 50 Church St., New York
Cravens, George W., Westfield, N. J.
Eadle, Freund & Campbell, 7 W. 45th St., New
York
Erbert, Charles C., Gluck Bldg., Niggree, Follo-Egbert, Charles C., Gluck Bldg., Niagara Falls, N. Y. Engineering Sales Co. (Inc.), New Orleans, La. Fletcher, E. L., 542 Fairfield Ave., Fletcher-Thompson (Inc.), Bridgeport, Conn. Franz, Walter C., Union Trust Bldg., Cincinnati, Hanscom, William W., 848 Clayton St., San-Francisco, Cal.
Hardesty, Frederick S., Commercial Natl. Bank
Bldg., Washington, D. C.
Harris, Ford W., 933 Higgins Bldg., Los Angeles, Cal. Hatch, Edwin G., 120 Broadway, New York Hirsch, Gustav, 200 Hartman Bldg., Columbus, Ohio Hollis French & Allen Hubbard, 88 Pearl St., Hollis French & Allen Hubbard, 88 Pearl St., Boston, Mass.
Hoxie, Geo. L., 50 East 41st St., New York Humphrey, C. W., 1034 Gramercy Drive, Los Angeles, Cal.
Humphrey, Henry H., 1312 Chemical Bldg., St. Louis, Mo.
Hutchison, Cary T., 65 W. 54th St., New York Hutchison, Miller Reese, 233 Broadway, New York, N. Y.
Industrial Engineers Corp'n, Suite 920 Victoria Bldg., St. Louis, Missouri Bldg., St. Louis, Missouri Jackson, Wm. B., Pittsfield, Mass. Jacobson, Ernst, 206 E. Fourth St., Davenport, Īa. Jammer, Edwin W., 160 Broadway, New York Koebig, A. W., 841 Title Insurnace Bldg., Los Angeles, Cal. Lyman, James, Sargent & Lundy, 72 West Adams St., Chicago, Ill. McAllister, Addams S., 261 West 23rd St., New York work
Merthon, Ralph D., 143 Liberty St., New York
Moore & Co., W. E., 706 Union Bank Bldg.,
Pittsburgh, Pa.
Mullergren, Arthur L., Firestone Bldg., Kansas City, Mo.
Pillsbury Co., Charles L., 2nd Ave., & 12th St.,
Minneapolis, Minn.
Poole, Cecil P., Atlanta, Ga.
Power Engineering Co., 621 Metropolitan Life
Bldg., Minneapolis, Minn.
Rabbitt, James A. Engineering Corp'n, 115
Broadway, New York, N. Y.
Republic Engineers (Inc.), 60 Broadway, New
York Richardson & Gray, 220 Devonshire St., Boston. 9, Mass.
Robinson, Dwight P. & Co. (Inc.), 125 East 46th
St., New York, N. Y.
Rossman, J. G., Scotch Plains, N. J.
Rucker, B. Parks, 103 Park Ave., New York,
N. Y. Salisbury, Royal D. Co., 1600 Downing St., Denver, Colo. Sanderson & Porter, 52 William St., New York Sawtelle, B. M., 5 Beckman St., New York Sayer, E. Y., 1328 Broadway, New York Scott, Arthur C., 18161/2 Main St., Dallas, Texas Sessions, Fra land, Ohio Frank L., Rockefeller Bldg., CleveSmith, Harold B., Worcester Polytechnic Inst., Worcester, Mass.
Spengler, Warren D., Marshall Bldg., Cleveland,
Ohio

Stebbins, Theodore, 34 Gramercy Park, New

York
Sutton, Frank, 140 Cedar St., New York
Taylor, Percy B., Essex Bldg., Newark, N. J.
Thomas, Percy H., 120 Broadway, New York
Toltz, King and Day (Inc.), 1410 Pioneer Bldg.,
St. Paul, Minn.
Vaughan, John F., 185 Devonshire St., Boston, York

Mass.
Waters, W. L., 150 Nassau St., New York
Westcott & Mapes (Inc.), 207 Orange St., New

Whiting, Charles W., 148 State St., Boston,

ELECTRICAL INSTALLATIONS

Acheson, A R. 601 Eckel Theatre Bldg., Syracuse, N. Y.
Garland, C. M., 1st National Bank Bldg.,

Chicago, Ill.

ELECTRICAL MACHINERY (Designing)
Adams, C. A., 33 West 39th St., New York,
N. Y.

ELECTRICAL BAILWAYS
Hutchinson, Cary T., 65 West 54th St., New
York, N. Y.

ELEVATORS (See also Grain)
Posey, James, 925 Fidelity Bldg., Baltimore, Md.

ENGINE REGULATION
Sargent, John W., 303 Benefit St., Providence, R. I.

ENGINES

Mass.

—Gas (Designing)
Shaw, Louis E., 179 North Parkway, East
Orange, N. J.

-Internal Combustion

Lucke, Charles E., Columbia University, New York Parker, Francis W., 1410 Marquette Bldg., Chicago, Ill. Weaver & Kemble, 5103 Euclid Ave., Cleve-Weaver & land, O.

-Oil (Diesel)

Verhey, Hubert C., 1028 Real Estate Trust Bldg., Philadelphia, Pa.

-- Uniflow

Swartwout, Everett W., 20 Lafayette St., White Plains, New York

ENGINES, GAS

Dock, Herman, Engineers' Club, New York Suplee, Henry H., Commercial Nat'l Bank Bldg., Washington, D. C.

EQUIPMENT (See also Building, Chemical Works, Cocoa Pressing, Coke Plant, Die Sinking, Industrial Plant, Oil Pressing, Petroleum Distillation, Projectile Producing, Chemical

Railway, Sprinkler)
Buckley, John H., 243 Warburton Ave., Yonkers,
N. Y.

Colwell, James V. V., 105 W. 40th St., New York, N. Y.

Mandel, Arthur C., 56 East 87th St., New York, Rothwell, C. R., 192 Broadway, New York

-Electrical

Schloss, Newton L., 531 W. 143rd St., Apt. 64, New York

EVAPORATORS

Honolulu Iron Works Co., 233 Broadway, New Manitus Engineering Co. (Inc.), 15 East 40th St., New York, N. Y.

EXAMINATION & REPORTS (See also In-

Arison, Goodwin & Knapp, 327 S. LaSalle St.,

Chicago, Ill.

Baker, Charles Whiting, The Engineering Business Exchange, 30 Church St., New York City
Bennett, Howard D., 2114 Allendale St., Balti-

Bennett, Howard D., 2114 Alleuguage St., Balti-more, Md.
Brinton, Willard C., 17 W. 44th St., New York
Cary, Albert A., 95 Liberty St., New York
Collins, Hubert E., 132 Boyce Ave., Utica, N. Y.
Crowell, Henry W., Room 1026 Kinney Bldg.,
Newark, N. J.
Day & Zimmermann (Inc.), 611 Chestnut St.,
Philadalphia Pa.

Day & Zimmermann (Inc.), 611 Chestnut St., Philadelphia, Pa.
Fassett, Francis K., 1302-1303 U. B. Bldg., Dayton, Ohio
Fletcher, E. L., 542 Fairfield Ave., Fletcher-Thompson (Inc.), Bridgeport, Conn.
Hastings, Glen B., First Nat'l Bank Bldg., Williamsport, Pa.
Holland, Ackerman & Holland, Lawrence Bldg., Ann Arbor. Mich.

Ann Arbor, Mich. Kaighn, Herbert E., 2600 Harrison St., Wilmington, Del.

Kraemer, Milton, 515-517 Rialto Bldg., San

Araemer, Milton, 515-517 Rialto Bldg., San Francisco, Cal. Manitus Engineering Co. (Inc.), 15 East 40th St., New York, N. Y. Manly & Veal, 250 W. 54th St., New York, N. Y. Richardson & Gray, 220 Devonshire St., Boston, 9, Mass. Spengler, Warren D., Marshall Bldg., Cleveland, Ohio Tyng, Arthur 810 Isococic Pld. 2 7

Tyng, Arthur, 810 Iroquois Bldg., Buffalo, N. Y. White, J. G. Engineering Corp'n, 43 Exchange Place, New York

-Steam Bunnell, S. H., 103 Park Ave., New York, N. Y.

-Exhaust Bunnell, S. H., 103 Park Ave., New York, N. Y.

EXCAVATIONSMassey, Geo. B. Co., Peoples Gas Bldg., Chicago,

EXPERIMENTAL

Mudge, Sterling W., Pratt Institute, Brooklyn, N. Y.

F

FACTORIES (See also Sugar)

-Construction

-Construction
Bennett, Wilmer C., 189 W. Madison St.,
Chicago, Ill.
Chase, Frank D. (Inc.), 645 North Michigan
Ave., Chicago, Ill.
Ferguson, H. S., 200 Fifth Ave., New York
Powell, W. B., Cundall, Powell & Mosher
(Inc.), 80 W. Genesee St., Buffalo, N. Y.

-Equipment Installation Schlank, Elias, 51 Pennsylvania Ave., Newark, N. J.

-Layout
Hastings, Glen B., First Nat'l Bank Bldg.,
Williamsport, Pa.
Mayo, Edward H., 412 Traction Terminal
Bldg., Indianapolis, Ind.
U. S. Products Corp'n, 1423 McCormick Bldg.,

U. S. Products Corp'n, 1423 McCormick Bldg., Chicago, Ill. Walter Engineering Co., 216 Ludlow Bldg., Dayton, Ohio

—Management
Gerber, S. R., 309 Broadway, New York, N. Y.
Lloyd, Robert M., 347 Madison Ave., New York,
Meron, Frederick, 27 Cedar St., New York,
N. Y.

Organization Collins, Hubert E., 132 Boyce Ave., Utica, N. Y.

-Planning Cundall, Robert N., Pres., Cundall, Powell & Mosher, (Inc.), 80 W. Genesee St., Buffalo, FACTORIES (Continued)

—Sprinkler Equipment Hoagland, Ira G., 80 Maiden Lane, New York FIELD RESEARCH WORK

Fink, J. B., 421 Security Bldg., Tulsa, Okla.
Fowler, Geo. L., 114 Liberty St., New York
Peterson & Co., Frank P, 535 N. Cheyenne St.,
Tulsa, Okla.

FILTRATION PLANTS

-Bugar ent, R. S., Pres., Robert Sayre Kent (Inc.), 50 Court St., Brooklyn, N. Y.

Kent, R. S., Pres., R. S. Kent (Inc.), 50 Court St., Brooklyn, N. Y.

FIRE BOATS Bennett, Howard D., 2114 Allendale St., Balti-more, Md.

FIRE PREVENTION Ancona, John F., Cutler Bldg., Rochester, N. Y. Davis, Charles Ethan, 347 Madison Ave., Davis, Char New York

Hoagland, Ira G., 80 Maiden Lane, New York Posey, James, 925 Fidelity Bldg., Baltimore, Md. FLOUR MILLING PLANTS

Ingraham, Alexander, Calgary, Alberta, Canada

FORGE SHOPS Ellis, Frank I., 2126 Farmers Bank Bldg., Pittsburgh, Pa.
Meron, Frederick, 27 Cedar St., New York, N. Y.

Loss, Henrik V., Witherspoon Bldg., Philadelphia, Pa.

FOUNDATIONS
Burt, William H., 120 Broadway, New York
Moran, Maurice & Proctor, 55 Liberty St.,
New York
Thomason, T. Kennard, 50 Church St., New
York, N. Y.

York, N. Y.

FOUNDEY PLANTS (See also Iron Foundry)
Carliss, Oswald T., Plainfield, N. J.
Esselstyn, Murphy & Hanford, 810 Marquette
Bldg., Detroit, Mich.
Hardy, Clement A., Room 654, Railway Exchange Bldg., Chicago, Ill.
Hastings, Glen B., First Nat'l Bank Bldg.,
Williamsport, Pa.
Lane, H. M. Co., 701 Owen Bldg., Detroit,
Mich.
McLain's System (Inc.) 2600

McI. McLain's System (Inc.), Milwaukee, Wis. Moldenke, Dr. Richard, Watchung, N. J. Moore, W. E. & Co., 706 Union Bank Bldg., Pittsburgh, Pa. Robinson, Louis G., 31 E. 4th St., Cincinnati, O. Suck, Adolph, Hyde Park Station, Boston, Mass.

FUEL (See also Oil, Powdered Coal)
Denk, F. J., 1216 House Bldg., Pittsburgh, Pa.
Uehling, F. F., Empire Bldg., New York, N. Y. --- Utilisation

Lucke, Charles E., Columbia University, New York, N. Y.

FURNACES (See also Cupolas, Electric)

-Electric
Hastings, Glen B., First Nat'l Bank Bldg.,
Williamsport, Pa.
Moore, W. E. & Co., 706 Union Bank Bldg.,
Pittsburgh, Pa.

—Industrial
Cary, Albert A., 95 Liberty St., New York
Denk, F. J., 1216 House Bldg., Pittsburgh, Pa.
Meade & Co., Richard K., 11 E. Fayette St.,
Baltimore. Md.
Misostow, Henry, 536 Rush St., Chicago, Ill.
Quigley, W. S., 26 Courtiandt St., New York,
N. Y.
Parkin W. O. 26 Courtinate St.

Renkin, W. O., 26 Cortlandt St., New York, N. Y. Schwab, Gustav, 525 Market St., San Francisco,

Syracuse Industrial Gas Co., 206 McCarthy Bldg., Syracuse, N. Y.

G

GAGES Emery, A. H., Glenbrook, Conn.

GAGING Gage-Engineering Service Co., 1410 H St., N. W., Washington, D. C.

GAS (See also Natural, Testing)
Allison, James E. & Co., Security Bldg., St.
Louis, Mo.

Almert, Harold, 209 S. La Salle St., Chicago. T11.

Denk, F. J., 1216 House Bldg., Pittsburgh, Pa. Ehrmann, Carl, Kennedy Bldg., Tulsa, Okla. Garland, C. M., First Nat'l Bank Bldg., Chicago,

Humphreys & Miller (Inc.), 165 Broadway, New York Shiebler, Marvin, 80 Broadway, New York, N. Y.

N. Y.
Steere Engineering Co., Woodward & Horton
Aves., Detroit, Mich.
Syracuse Industrial Gas Co., 206 McCarthy
Bldg., Syracuse, N. Y.
Unger, John S., 3344 Broadway, Chicago,
Ill.

Wainright, Arthur V., 49 Wall St., New York, N. Y.

GAS AND OIL Scott, Arthur C., 18161/2 Main St., Dallas, Texas

GAS CONDENSERS Steere Engineering Co., Woodward & Horton Aves., Detroit, Mich.

GAS WASHING Freyn, Brassert & Co., 122 S. Michigan Ave., Chicago, Ill.
Steere Engineering Co., Woodward & Horton
Aves., Detroit, Mich.

GABULINE EXTRACTION PLANTS
Bertsch, John C., 10 Lucerne Apts., Cor. 10th &
S. Boston Sts., Tulsa, Okla.
Hope Engineering & Supply Co., Mt. Vernon,
Ohio

GASOLINE FROM NATURAL GAS
Peterson, Frank P. & Co., 535 N. Cheyenne St.,
Tulsa, Okla.

GASOLINE PLANTS Ehrmann, Carl, Kennedy Bldg., Tulsa, Okl Fink, J. B., 421 Security Bldg., Tulsa, Okla. GEOLOGICAL

Scott, Arthur C., 18161/2 Main St., Dallas, Texas

Sulphur Henning, John L., Lake Charles, La.

GRAIN ELEVATORS
Toltz, King & Day (Inc.). 1410 Pioneer Bldg.,
St. Paul, Minn.

GYPSUM PLANT Brown, Holcombe J., 20 Beacon St., Boston, Mass

GYROSCOPIC Norden, Carl L., 375 Fulton St., Brooklys. N. Y.

Н

HANDLING AND PACKING MACHINERY Neale, William McC., P. O. Box 351, Greens-boro, N. C.

HARBOR IMPROVEMENTS (See also Port Development, River and Harbor Improvements Bennett, Howard D., 2114 Allendale St., Balti-

more, Md. Donnelly, William T., 17 Battery Place New Vork

HEAT TREATING

Quigley, W. S., 26 Cortlandt St., New York, Renkin, W. O., 26 Cortlandt St., New York, Schwab, Gustav, 525 Market St., San Francisco, Calif.

HEATING

Duryce, Andrew B., 39 Liberty Ave., New Rochelle, N. Y. Franz, Walter G., Union Trust Bldg., Cincinnati,

Landvoigt, Thomas E., Room 102, Municipal Bldg., Washington, D. C. Little & Shepard, 2033 Dime Bank Bldg., Detroit, Mich.
Richardson, Chas. E., 35 E. 41st St., New York,

Richmond, Knight C., 10 Weybosset St., Providence, R. I. Stevens, John A., 8 Merrimack St., Lowell, Mass.

HEATING AND VENTILATING

Acheson, A. R., 601 Eckel Theatre Bldg., Syracuse, N. Y.
Allan, Charles D., 1732 S. Michigan Blvd., Chicago, Ill.
Ancona, John F., Cutler Bldg., Rochester, N. Y.
Baldwin, Wm. J., 601 World Bldg., New York,

Ballinger & Perrot, 329 S. Broad St., Phila-

delphia, Pa.

Bratt & Petersen, Hackensack, N. J. Briner, E. A., 559 Central Ave., E. Orange, N. J. Carr, E. W. (Inc.), 415 Gravier St., New Orleans,

Cary, Albert A., 95 Liberty St., New York Cherry, L. A., Cundall, Powell & Mosher (Inc.), 80 W. Genesee St., Buffalo, N. Y. Cundall, Robert N., Pres., Cundall, Powell & Mosher (Inc.), 80 W. Genesee St., Buffalo,

Moster Mr. W. Genesee St., Junialo, N. Y.
Ehrlich, M. Wm., 11 John St., New York
Ellingwood, Elliott L., 338 H. W. Hellman Bldg.,
Los Angeles, Cal.
Feldman, A. M., 145 West 45th St., New York,

N. Y.
Godfrey, Foskett H., 502 Provident Bldg.,
Tacoma, Wash.
Hoffman, J. D., Purdue University, Lafayette,

Ind. Hollis French & Allen Hubbard, 88 Pearl St., Boston, Mass. Kimball, Richard D. Co., 15 W. 38th St., New

York Leland, William E., 434 Holbrook Bldg., San

Leland, William E., 434 Holbrook Bldg., San Francisco, Cal.

MacLeod, Norman M., 16 W. Rockland St., Germantown, Philadelphia, Pa.

McCann, Frank G., (Office) Room 515, Municipal Bldg., New York

McHollan, James A., 116 E. 19th St., New York

Pillsbury Co., Charles L., 2nd Avc. & 12th St., Minneapolis, Minn.

Posey, James, 925 Fidelity Bldg., Baltimore, Md.

Richardson & Gray, 220 Devonshire St., Boston,

Richardsou & C., 9, 9, Mass.
Richmond Engineering Co., Richmond, Va.
Riley, C. L., Clark, MacMullen & Riley (Inc.),
101 Park Ave., New York
Schoenijahn, Robert P., Church Bldg., Wil-

Taylor, Percy B., Essex Bldg., Newark, N. J.
Toltz, King & Day (Inc.), 1410 Pioneer Bldg.,
St. Paul, Minn.

HEATING SYSTEMS

-Vacuum

Scrivenor, Arthur, Mutual Bldg., Richmond, Va. HOISTING (See also Conveying) Buckley, John H., 243 Warburton Ave., Yonkers, N. Y.

Horton, John T., 242 Bradhurst Ave., New York

HOT WATER Allan, Charles D., 1732 S. Michigan Blvd., Chicago, Ill.

HOTELS

Place, Clyde R., Grand Central Terminal, New York, N. Y.

HYDRAULIC Allen, Henry A., Room 23, 154 W. Randolph St., Chicago, Ill. Allen, Charles M., Worcester Polytechnic Inst.,

Allen, Charles M., Worcester Polytechnic Inst., Worcester, Mass.

Beaubien, James A., 50 E. 42nd St., New York Brown & Co., Edward C., 220 Devonshire St., Boston, Mass.

Burr, William H., 120 Broadway, New York Carver, Fred S., 8 W. 40th St., New York Cooper, Hugh L., 101 Park Ave., New York Dallis, Park A., Candler Bldg., Atlanta, Ga. Egbert, Charles C., Gluck Bldg., Niagara Falls, N. Y.

Groat B. F., 2400 Oliver Bldg., Pittsburgh, Pa.

Groat, B. F., 2400 Oliver Bldg., Pittsburgh, Pa. Hale, Richard A., Lawrence, Mass. Holland, Ackerman & Holland, Lawrence Bldg.,

Ann Arbor, Mich. Hollis French & Allen Hubbard, 88 Pearl St.,

Hollis French & Allen Hubbard, oo rean Sc., Boston, Mass. Hornung, Geo., 512 Fairfield Ave., Bellevue, Ky. Johnson, R. D., 60 Wall St., New York Koebig, A. W., 841 Title Insurance Bldg., Los Angeles, Cal. Landreth, Olin H., 156 5th Ave., New York Maury, Dabney H., Chicago, Ill. Richardson & Gray, 220 Devonshire St., Boston, O Mass.

9, Mass.

Safford, Arthur T., 66 Broadway, Lowell, Mass. Scott, Arthur C., 1816¹/₂ Main St., Dallas, Texas Smith, Edward J., 30 Church St., New York, N. Y.

Spengler, Warren D., Marshall Bldg., Cleveland, Ohio

Switzer, John A., University of Tenn., Knox-ville, Tenn.
Toltz, King & Day (Inc.), 1410 Pioneer Bldg., St. Paul, Minn.
Vaughan, John F., 185 Devonshire St., Boston, Mass.

Malace, Joseph H. & Co., 5 Beekman St., New York, N. Y. White, J. G. Engineering Corp'n, 43 Exchange Place, New York

HYDRAULIC MACHINERY

Carver, Fred S., 8 W. 40th St., New York Loss, Henrik V., Witherspoon Bldg., Philadelphia. Pa. Wood, Wm. H., 10 South Ave., Media, I

HYDRAULIC MEASUREMENTS Safford, Arthur T., 66 Broadway, Lowell, Mass. HYDRAULIC SHELL FORGING Charles Ethan, 347 Madison Ave., Davis, Cha New York

HYDRO-ELECTRIC (See also Power Plants, Hydroelectric) Egbert, Charles C., Gluck Bldg., Niagara Falls, N. Y.

Rucker, B. Parks, 103 Park Ave., New York, N. Y.

AYDEO-ELECTRIC DEVELOPMENT
Ferguson, H. S., 200 Fifth Ave., New York
Holland, Ackerman & Holland, Lawrence
Bldg., Ann Arbor, Mich.
Hoxie, Geo. L., 50 E. 41st St., New York
Power Engineering Co., 621 Metropolitan Life
Bldg., Minneapolis, Minn.
Yaughan, John F., 185 Devonshire St., Boston,
Mass.

I

ICE BOATS

Bennett, Howard D., 2114 Allendale St., Balti-more, Md.

TOR MAKING PLANTS

Nusbaum, Lee, 1119-21 N. Howard St., Phila-delphia, Pa.

ILLUMINATING Le Page, C. B., Institute of Tech., Hoboken, N. J. McAllister, Addams S., 261 W. 23rd St., New

INDUSTRIAL

Almert, Harold. 209 S. La Salle St., Chicago, Ill. Ancona, John F., Cutler Bldg., Rochester, N. Y. Arison, Goodwin & Kuapp, 327 S. La Salle St.,

Arison, Goodwin & Knapp, 327 S. La Salle St., Chicago, Ill.
Bacon, George W., Ford, Bacon & Davis, 115
Broadway, New York, N. Y.
Bernsted, E. B., 908 Insurance Exchange Bldg.,
San Francisco, Cal.
Birnie, Hawkins & Watson, 511 Fifth Ave.,
New York
Breslove, Jos., Oliver Bldg., Pittsburgh, Pa.
Brill, Geo. M., 2607 Singer Bldg., New York

City Brown, Wendell S., 1009 Hospital Trust Bldg., Providence, R. I. Brounell, Louis M., 33 W. 42nd St., New York

City
Camp, Eugene V., Box 421, Atlanta, Ga.
Chase, Brank D. (Inc.), 645 North Michigan
Ave., Chicago, Ill.
Churchill, W. L., 103 Park Ave., New York
Clark, Wallace, 50 W. 12th St., New York
Continental Industrial Engineers (Inc.), 347
Monadonck Bidg., Chicago, Ill.
Cooley-Marvin Co., 15 Ashburton Place, Boston,

Mass.
Cavens, George W., Westfield, N. J.
Day & Zimmermann (Inc.), 611 Chestnut St.,
Philadelphia, Pa.
Edgar, O. N., 128 Madison Ave., Vinita Park,
Clayton, Mo.
Ehrlich, M. Wm., 11 John St., New York
Emerson, Harrington, 125 Riversida Deina Nam.

Entrien, M. will. I 125 Riverside Drive, New York, N. Y. Estes, L. V. (Inc.), 202 S. State St., Chicago, Ill. Farnham, Dwight T., 99 Oak St., Binghamton,

Firestone, Sigmund, 59-61 South Ave., Rochester,

Firestone, Sigmund, 59-61 South Ave., Rochester, New York Fletcher, E. L., 542 Fairfield Ave., Fletcher-Thompson (Inc.), Bridgeport, Conn. Freyn, Brassert & Co., 122 S. Michigan Ave., Chicago, Ill. Gerber, S. R., 309 Broadway, New York, N. Y. Griswold, H. J., 285 Beaver Hall Hill, Montreal,

P. Q. Halbfass, Arnold J., 11 Nischeweg, Berne,

Switzerland
Hastings, Glen B., First Nat'l Bank Bldg.,
Williamsport, Pa.
Ingham, Howard M., 140 Nassau St., New York,

Herbert A., 2600 Harrison St., Wil-Kaighn, mington, Del. och, William H., Jr., 1500 Century Bldg.,

Chicago, Ill.

Latter, Edward D., 61 Broadway, New York
Lewis, Warren B., 740 Grosvenor Bldg., Providence, R. I.

Luchrs, Daniel M., Ellaston Bldg., Cleveland,

Ohio Manitus Engineering Co. (Inc.), 15 E. 40th St.,

New York, N. Y. Meade, Richard K. & Co., 11 E. Fayette St.,

Meade, Richard K. & Co., 11 E. Fayette St., Baltimore, Md.
Moore, W. E. & Co., 706 Union Bank Bldg., Pittsburgh, Pa.
Moses, Pope & Trainer (Inc.), 366 Fifth Ave., New York, N. Y.
Parks, Byron E. & Son, 623-25-27 Michigan Trust Bldg., Grand Rapids, Mich.
Porter, Holbrook F. J., 522 5th Ave., New York Railway & Industrial Engrs. (Inc.), 25 Broad St., New York Randolph, L. S., 5840 Bellona Ave., Baltimore, Md.

Md.
Riley, C. L., Clar, MacMullen & Riley (Inc.),
101 Park Ave., New York

Scovell, Clinton H., 110 State St., Boston, Mass. Scribner, Chas. F., 4046 S. Michigan Ave., Chicago, Ill.

Scrivenor, Arthur, Mutual Bldg., Richmond, Va. Sheldon, F. P. & Son, 1008 Hospital Trust Bldg.,

Sneigon, F. P. & Son, 1008 Hospital Prust Bidg., Providence, R. I. Shepard, George H, Purdue University, La Fayette, Ind. Solomon, G. R., 949 Broadway, New York Spengler, Warren D., Marshall Bldg., Cleveland,

Taggart, James M., 1170 Broadway, New York, N. Y.

Thompson, Uldric, Jr. (Inc.), 120 Broadway, New York U. S. Products Corp'n, 1423 McCormick Bldg. Chicago, Ill. Wallace & Co., Joseph H., 5 Beekman St.,

Wallace & Co., Joseph n., S. L., New York
Westcott & Mapes (Inc.), 207 Orange St.,
New Haven, Conn.
Description of the Control of the Control

New Haven, Conn.
White Engineering Corp'n, J. G. 43 Exchange
Place, New York
Wood, Albert C., 1203 Stock Exchange Bldg.,
Wynnefeld, Philadelphia, Pa.
Wrentmore & Reynolds, Manila, P. I.

INDUSTRIAL BUILDINGS

Esselstyn, Murphy & Hansford, 810 Marquette Bldg., Detroit, Mich.

INDUSTRIAL HOUSING

Knowles, Morris (Inc.), 1200 Jones Bldg., Pittsburgh, Pa.

INDUSTRIAL PLANTS (See also Valuation) Cannon-Swenson Co., 940 Monadnock Block,

Chicago, Ill.
Dallis, Park A. Candler Bldg., Atlanta, Ga.
Engel, Godfrey Sr. Construction Co., 17 Battery
St., New York

Fordyce, John R., Hot Springs National Park, Ark.

Ark. Haven, H. M. & Crosby, Wm. W., 40 Court St., Boston, Mass. Hollis French & Allen Hubbard, 88 Pearl St.,

Boston, Mass.
Kent, R. S., Pres., R. S. Kent (Inc.), 50 Court
St., Brooklyn, N. Y.
Koebig, A. W., 841 Title Insurance Bldg., Los
Angeles, Cal
Lane, H. M. Co., 701 Owen Bldg., Detroit, Mich.

Lockwood, Green & Co., 60 Federal St., Boston, McClintock & Craig, 33 Lyman St., Springfield,

Mass Main, Charles T., 201 Devonshire St., Boston,

Mass. Manitus Engineering Co. (Inc.), 15 East 40th St., New York, N. V. Place, Clyde R., Grand Central Terminal, New York

Richardson & Gray, 220 Devonshire St., Boston

Richardson & Gray, 220 Devonshire St., Boston 9, Mass.
Rothwell, C. R., 192 Broadway, New York Vaughan, John F., 185 Devonshire St., Boston, Mass.

Viola, Bartholomew, 309 Broadway, New York, Woodwell, J. E., 501 Fifth Ave., New York,

Designing Adler, Alphonse A., 9 Murray St., New York, N. Y.

-Equipment (Hydraulic) Eastern Machinery & Equipment Co. (Inc.), 1036 Commercial Trust Bldg., Philadelphia,

INDUSTRIAL RELATIONS Calder, John, 25 Merriam St., Lexington, Mass.

INLAND WATERWAYS Bennett, Howard D., 2114 Allendale St., Balti-more, Md. Bixby, William H., 1709 Lanier Place, N. W. Washington, D. C.

TERWAYS (Continued) Donnelly, William T., 17 Battery Place, New York Massey, Geo. B. Co., Peoples Gas Bldg., Chicago,

INSPECTION INSPECTION
Bennett, Howard D., 2114 Allendale St., Baltimore, Md.
Colwell, James V. V., 105 W. 40th St., New York, N. Y.
Conard, W. R., Burlington, N. J.
Eastern Machinery & Equipment Co., (Inc.), 1036 Commercial Trust Bldg., Philadelphia,

Gebhardt, G. F., Armour Inst. of Tech., Chicago, Ill. Lea, E. S., 229 Chestnut Ave., Trenton, N. J. Lovell, Alfred, 619 Harrison Bldg., Philadelphia,

Manly & Veal, 250 W. 54th St., New York, N. Y. Misostow, Henry, 536 Rush St., Chicago,

AMBULATING MATERIALS
Pike, Robert D., 74 New Montgomery St.,
San Francisco. Cal.,
Quigley, W. S., 26 Cortlandt St., New York,
N. Y.
Renkin, W. O., 26 Cortlandt St., New York,
N. Y.

INVENTIONS Neale, William McC., P. O. Box 351, Greens-boro, N. C.

—Development Abbott, W. G., Jr., Wilton, N. H. Broome, Ernest I., 49 Wall St., New York Fassett, Francis K., 1302-1303 U. B. Bldg., Dayton, Ohio
Lesions, Frank L., Rockefeller Bldg., Cleve-

land, Ohio INVESTIGATIONS (See also Examinations and Reports)
Allison, James E. & Co., Security Bldg., St.
Louis, Mo.
Almert, Harold, 209 S. La Salle St., Chicago, Arison, Goodwin & Knapp, 327 S. La Salle St., Chicago, Ill. Brill, Geo. M., 2607 Singer Bldg., New York City
Cary, Albert A., 95 Liberty St., New York
Collins, Hubert E., 132 Boyce Ave., Utica,
N. Y. Davis, Charles Ethan, 347 Madison Ave., New York Fassett, Francis K., 1302-1303 U. B. Bldg., Dayton, Ohio
Hubbard & Harris (Inc.), Bridgeport, Conn.
Perkins, George H., 134 Batterymarch St.,

Boston, Mass. Schuttler, Carl H., 731 Spitzer Bldg., Toledo, Ohio -Public Utilities Polakov, Walter N., 31 Nassau St., New Polakov,

Boston, Mas

York INVESTIGATIONS AND REPORTS Arison, Goodwin & Knapp, 327 S. La Salle St., Chicago, Ill. Crowell, Henry W., Room 1026 Kinney Bldg., Newark, N. J.

Myers, David Moffat, 110 W. 40th St., New York, N. Y.

IRON FOUNDRY Moore, Edwin A., Foot of Robeson St., Reading, Pa.

IERIGATION (See also Drainage)
Koebig, A. W., 841 Title Insurance Bldg., Los
Angeles, Cal.
Wright, William Q., 210 Merchants Exchange
Bldg., San Francisco, Cal.

JIGS AND FIXTURES

Dove-Smith & Son, 2255 Niagara Ave., Niagara Falls, N. Y. Walter Engineering Co., 216 Ludlow Bldg., Walter Dayton, Ohio

J

K

KILNS

Meade, Richard K. & Co., 11 E. Fayette St., Baltimore, Md.

-Bevivifying
Kent, R. S., Pres., Robert Sayre Kent (Inc.),
50 Court St., Brooklyn, N. Y.

-Rotary Kent, R. S., Pres., Robert Sayre Kent (Inc.), 50 Court St., Brooklyn, N. Y.

-- Stationary
Kent, R. S., Pres., Robert Sayre Kent (Inc.)
50 Court St., Brooklyn, N. Y.

L

LABOR (See also under Power Plants) ailway & Industrial Engineers (Inc.), 25 Broad St., New York Railway

LAND RECLAMATION (See also Drainage and Reclamation Bennett, Howard D., 2114 Allendale St., Baltimore, Md. Massey, Geo. B. Co., Peoples Gas Bldg., Chicago,

Wright, William Q., 210 Merchants Exchange Bldg., San Francisco, Cal.

LAYOUT (See also Factories)

Bennett, Howard D., 2114 Allendale St., Baltimore, Md. -Marine Plants

-Plant Brown, John Wilson, Jr., 1213 Filbert St., Philadelphia, Pa.

LEAD-LINED APPARATUS Viola, Bartholomew, 309 Broadway, New York LIGHTING Posey, James, 925 Fidelity Bldg., Baltimore, Md.

Richardson & Gray, 220 Devonshire St., Boston, 9. Mass Stevens, John A., 8 Merrimack St., Lowell,

Mass. LUBRICATION

Battle, J. R. Co., Otis Bldg., Philadelphia, Pa. Fish, Charles H., 73 Tremont St., Boston, Mass.

M

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-Manufacture Davis, Charles Ethan, 347 Madison Ave., New York MACHINERY or MACHINES (See Appraisals Automatic, Chocolate Making, Cotton Seed Crushing, Electric, Forging, Handling and Packing, Hydraulic, Special, Sugar, Testing, Textile, Wood Working)

MACHINERY DESIGNING

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Adler, Alphonse A., 9 Murray St., New York
Broome, Ernest L., 49 Wall St., New York City
Brown, Herman E., 115 Broadway, New York
Brown, John Wilson, Jr., 1213 Filbert St.,
Philadelphia, Pa.
Buch-Groff Co. (Inc.), 233 Broadway, New York,
N. Y.

Carpenter, George D., 903 E. State St., Ithaca, N. Y. Cooley & Marvin Co., 15 Ashburton Place,

Boston, Mass. Cummings, Henry H., 110 High St., Boston,

Mass. Cundall, Robert N., Pres., Cundalo, Powell & Mosher (Inc.), 80 W. Genesee St., Buffalo,

Dock, Herman, Engineers' Club, New York Dove-Smith & Son, 2255 Niagara Ave., Niagara Falls, N. Y.

Fassett, Francis K., 1302-1303 U. B. Bldg.,

Fassett, Francis K., 1302-1303 U. B. Bldg., Dayton, Ohio Fermier, E. J., College Station, Texas Fish, Charles H., 73 Tremont St., Boston, Mass. Furman, F. De. R., Stevens Inst. of Tech., Hoboken, N. J. Gooding, Charles S., 27 School St., Boston, Mass. Harris, Ford W., 933 Higgins Bldg., Los Angeles, Cal.

Hubbard & Harris (Inc.), Bridgeport, Conn. Loomis, Evarts G., 207 Market St., New York,

Manitus Engineering Co. (Inc.), 15 E. 40th St.,

Manitus Engineering Co. (Inc.), 15 E. 40th St., New York, N. Y. Mayo, Edward H., 412 Traction Terminal Bldg., Indianapolis, Ind. Misostow, Henry, 536 Rush St., Chicago, Ill. Modern Engineering Co., 318 Broadway, New York, N. Y. Neale, William McC., P. O. Box 351, Greens-boro, N. C. Newell, W. L., 1017 Alaska Bldg., Seattle, Wash.

wasn.
New Era Machinery Designing Co., 215 Parkway
Bldg., Philadelphia, Pa.
Norden, Carl L., 375 Fulton St., Brooklyn,
N. Y

N. Y Oswald, H. A., Hamilton Motors Co., Grand

Haven, Mich.
Penney, Harold D., 9 Murray St., New York
Rautenstrauch, Walter, 43 Exchange Place,

New York New York Scrivenor, Arthur, Mutual Bldg., Richmond, Va. Shaw, Louis E., 179 North Parkway, East Orange, N. J. Sintz, Claude, 311 Marquette Bldg., Detroit,

Sintz, Claude, 311 Marquette Buss., 2008., Mich. Walter Engineering Co., 216 Ludlow Bldg.,

Dayton, Ohio Wunsch & Washburn, 487 Broadway, New York

MAGNESITE PRODUCTS

Pike, Robert D., 74 New Montgomery St., San Francisco, Cal.

MANAGEMENT (See also Factories, Power Plants, Public Utilities, Shop) Almert, Harold, 209 S. La Salle St., Chicago,

Arison, Goodwin & Knapp, 327 S. La Salle St.,

Chicago, Ill.
Baker, Wm. H., 120 Broadway, New York
Bartlett, D. Dana, 321 Shawmuk Bank Bldg.,

Boston, Mass.
Bayne, C. William, 15 E. Hartford St., Muskegon, Mich.

Brill, Geo. M., 2607 Singer Bldg., New York City Brounell, Louis M., 33 W. 42nd St., New York

City
Calder, John. 25 Merriam St., Lexington, Mass.
Carpenter, George D., 903 E. State St., Ithaca,
N. Y.

Churchill, W. L., 103 Park Ave., New York Clark, Wallace, 50 W. 12th St., New York Colwell, James V. V., 105 W. 40th St., New York, N. Y. Cooke, Morris, Llewellyn, 401 W. Walnut Lane, Germantown, Philadelphia, Pa. Cooley-Marvin Co., 15 Ashburton Place, Boston, Mass

Cummings, L. T., Drefs, Cummings & Drefs, Book Bldg., Detroit, Mich. Davis, Charles Ethan, 347 Madison Ave., New Vork

Dock, Herman, Engineers' Club, New York Emerson, Harrington, 125 Riverside Drive, New York, N. Y.

Feiss, Richard A., 2149 W. 53rd St., Cleveland, Ō.

O.
Fleming, Henry S., 115 Broadway, New York
Fletcher, E. L., Fletcher-Thompson (Inc.),
542 Fairfield Ave., Bridgeport, Conn.
Gilbreth, Frank B. (Inc.), 68 Eagle Rock Way,
Montclair, N. J.
Hall, Keppele, 1109 Finance Bldg., S. Penn.
Sq., Philadelphia, Pa.
Hannah, Frederick A., 32 W. 40th St., New
York

Vork

Hathaway, H. K., Finance Bldg., S. Penn Sq., Philadelphia, Pa. Hutton, S. E., Cleveland, Ohio Industrial Engineers Corp'n, Suite 920, Victoria

Bldg., St. Louis, Mo. Keely, Royal R., cr. Macoy, 45 John St., New York

Kraemer, Milton, 515-517 Rialto Bldg., San Francisco, Cal.

Manitus Engineering Co. (Inc.), 15 E. 4th St., New York N. Y.

New York N. Y.
Merrick, Dwight V., 34 Gramercy Park, New York, N. Y.
Moses, Pope & Trainer (Inc.), 366 Fifth Ave., New York, N. Y.
Oswald, H. A., Hamilton Motors Co., Grand Haven, Mich.
Polakov, Walter N., 31 Nassau St., New York Radford, G. S., cr. Halstead Specialties Co., 503 Market St., San Francisco, Cal.
Railway & Industrial Engrs. (Inc.). 25 Broad

Railway & Industrial Engrs. (Inc.), 25 Broad St., New York Rautenstrauch, Walter, 43 Exchange Place,

New York Richardson, Chas. E., 35 E. 41st St., New York,

Shepard, George H., Purdue University, Lafayette, Ind. Spackman, Henry S., 2024 Arch St., Philadel-

phia, Pa Thompson & Lichtner, 136 Federal St., Boston,

Maldren, Frederick A., Edward Van Winkle, 37 Wall St., New York City Wolf, Robert B., 33 W. 42nd St., New York, N. Y.

MANUFACTURE (See Aeronautical Motors, Automobile, Machine Tools, Optical Glass, Time Fuse)

Davis, Charles Ethan, 347 Madison Ave., New York MANUFACTURING METHODS

New York Hubbard & Harris (Inc.), Bridgeport, Conn. Hutchison, Miller Reese, 51st Floor, 233 Broad-way, New York, N. Y. Manly & Veal, 250 W. 54th St., New York, N. Y. Rautenstrauch, Walter, 43 Exchange Pl., New

MANUFACTURING PROCESSES
Abbott, W. G., Jr., Wilton, N. H.
Sessions, Frank L., Rockefeller Building, Cleveland, Ohio

MARINE (See also Concrete Ships, Fire Boats, Ice Boats, Naval)
Bennett, Howard D., 2114 Allendale St., Baltimore, Md.
Bratt & Petersen, Hackensack, N. J.
Fryer, Ross L., Commercial National Bank
Bldg., Washington, D. C.

Hardesty, Frederick S., Commercial Natl. Bank Bldg., Washington, D. C.

MARINE SURVEYING

Bratt & Petersen, Hackensack, N. J. Wilson, James A., 2-4 Stone St., New York

MARINE TERMINALS

Bennett, Howard D., 2114 Allendale St., Baltimore. Md.

MARINE TRANSPORTATION

Donnelly, William T., 17 Battery Place, New

MATHEMATICS

Gunther, Charles O., Stevens Institute of Tech., Hoboken, N. J.

RECHANICAL

Acheson, A. R., 601 Eckel Theatre Bldg., Syracuse, N. Y.

cuse, N. Y.
Adams, Edward T., 1409 Crenshaw Blvd.,
Los Angeles, Cal
Adams, Henry, 33 West 39th St., New York,
N. Y.
Adler, Alphonase A., 9 Murray St., New York
Allan, Charles D., 1732 S. Michigan Blvd.,
Chicago, Ill. Chicago, Ill.

Albert M., 1900 Euclid Ave., Cleveland,

Allen, Albert M., 1900 Euclid Ave., Cleveland, Ohio Allen, Henry A., Room 23, No. 154 West Randolph St., Chicago, Ill. Allen, Thos. H., Bank of Commerce Bldg., Memphis, Tenn. Allen, W. D., 951 Stuart Bldg., Seattle, Wash. Almert, Harold, 209 S. LaSalle St., Chicago, Ill. American Industrial Engrg. Co., Monadnock Block, Chicago, Ill. Ancona, John F., Cutler Bldg., Rochester, N. Y. Anderson, F. Paul, Dean, College of Engrg., University of Kentucky, Lexington, Ky. Arizpe, Emilio, Apartado 66, Saltillo, Coah, Mexico

Ashley, Frank M., 154 Nassau St., New York, N. Y.

N. Y. Baker, Wm. H., 120 Broadway, New York Ballinger & Perrot, 329 S. Broad St., Philadelphia,

Barber, Clarence M., 83 Blaine Ave., Detroit, Mich.

Barkelew, James T., 911 Central Bldg., Los Angeles, Calif. Barkley, Fred W., 220 Devonshire St., Boston,

Mass.

Mass. Barlow, F. C., Portland, Oregon Barnaby, Chas. W., 257 Hamilton Ave., New Brighton, Staten Island, N. Y. Barnes, William O., 770 Main St., Leominster,

Mass, Mass, Baum, Frank G., 1901-2 Hobart Bldg., San Francisco, Calif.
Baxter, B. M., 5716 Euclid Ave., Cleveland,

Bayne, C. William, 15 B. Hartford St., Muskegon, Mich.

Behr, H. C., 2 Rector St., New York Bell, John B., 111 Broadway, New York Benedict, Howard G., 2269 Grandview Ave.,

Cleveland, Ohio
Bennett, Howard D., 2114 Allendale St., Baltimore, Md.

Bensel, John A., Bernardsville, N. J. Benster, Halsey, 1603 2nd St., East Moline,

Bentley & Holmgren, 406 Court Exchange Bidg., Bridgeport, Conn. Beranger, Jos. P., 129 Front St., New York Berg, Christian P., 10 S. La Salle St., Chicago, Ill.

III.
Bernner, Milton St. John, 46 Whitney Ave., Elmhurst, L. I., N. Y.
Bernsted, E. B., 908 Insurance Exchange Bldg., San Francisco, Calif.
Berry, A. O., 451 Oak St., Chattanooga, Tenn.
Bertsch, John C., 10 Lucerne Apts., Cor. 10th & S. Boston Sts., Tulsa, Oklahoma
Bierbaum, Christopher H., 1011 Mutual Life Building, Buffalo, N. Y.

Blackwood, Jos. H., 528 Woodward Bldg., Washington, D. C.
Blatchley, Chas. A., 1052 Drexel Bldg., Philadelphia, Pa.
Blee, Harry H., 311 Orange Ave., Santa Ana, Cal.
Block Louis 503 Block Acres 200 Block

Cal.
Block, Louis, 501 Fifth Ave., New York
Blood, L. H., Union Central Bldg., Cincinnati,
Ohio
Bogart, A. L., 72 W. Minnehaha Parkway.

ogart, A. L., 72 W. Minnehaha Parkway, Minneapolis, Minn.

Bonine, Charles E., 20 S. 15th St., Philadelphia, Pa.

Borge Incinerator Corp'n, 1216 Flatiron Bldg., New York Bowers, George W., 53 Devonshire St., Boston,

Mass Broyd, John T., 149 E. 40th St., New York Bratt & Petersen, Hackensack, N. J. Brett, Henry E., 533 Higgins Bldg., Los Angeles,

Calif.

Calif.
Brewster, Henry A., Syracuse, N. Y.
Brightman, Howard L., care Brightman Mfg.
Co., South Columbus, O.
Brill, Geo. M., 2607 Singer Bldg., New York
Briner, E. A., 559 Central Ave., E. Orange, N. J.
Broom, Benj. A., 303-4 Metropolitan Bldg.,
Sioux City, Ia.
Broome, Ernest L., 49 Wall St., New York City
Brossman, Chas., 1503 Merchants' Bank Bldg.,
Indianapolis, Ind.
Brown, Edward C. & Co., 220 Devonshire St.,
Boston, Mass.
Brown, Herman E., 115 Broadway, New York
Brown, John Wilson, Jr., 1213 Filbert St.,
Philadelphia, Pa.
Brush, Alanson P., 713-15 Kresge Bldg., Detroit,
Mich.
Buckley, John H., 243 Warburton Ave., Yonkers,

Buckley, John H., 243 Warburton Ave., Yonkers, N. Y.

Bulkeley, Claude A., 1313 W. 8th St., Wilmington, Del.
Bumsted, E. Bradford, 908 Insurance Exchange,

San Francisco, Cal.

Bunnell, S. H., 103 Park Ave., New York, N. Y.

Burnet, Edgar E., Lincoln, California

Burr Co., Champion, Ill.

Calder, John, 25 Merriam St., Lexington, Mass.

Cannon-Swenson Co., 940 Monadnock Bldg.,

Chicago, Ill.
Cant, H. P., Land Title Bldg., Philadelphia, Pa.
Carey, James L., 208 N. Laramie Ave., Chicago, TII. Carpenter, George D., 903 E. State St., Ithaca,

N. Y. Carr, E. W. (Inc.), 415 Gravier St., New Orleans,

La.
Carse, David B., 71 Broadway, New York
Carter, Henry W., 1425-7 Monadnock Bik.,
Chicago, III.
Carver, Fred S., 8 West 40th St., New York
Cary, Albert A., 95 Liberty St., New York
Casler, Frank W., 455 Mt. Prospect Ave.,
Nawark, N. J.
Chandler, R. E., Moscow, Idaho
Charter, James A., 1438 East 65th St., Chicago,
Illinois
Christie. A. G. Johns Honking Vicination

Illinois
Christie, A. G., Johns Hopkins University,
Baltimore, Md.
Christie, Wm. Wallace, 66 W. Ridgewood Ave.,
Ridgewood, N. J.
Church, Elihu C., 4 East 130th St., New York,
N. Y.
Cleaton Co. (Ltd.), 20 St. Nicholas St., Montreal,
Que., Canada
Colby, Albert Ladd, Brighton St., Bethlehem,
Pa.

Pa Colles, Geo. W., 1509 Texas Ave., Houston,

Texas Collins, Francis W., 50 Church St., New York,

Collins, Francis ...,
N. Y.
Collins, Hubert E., 132 Boyce Ave., Utica, N. Y.
Comstock, Charles Worthington, First Nat'l
Bank Bidg., Denver, Colo.
Conant, Wm. S., 508 Griswold St., Detroit,

Mich. Conard, W. R., Burlington, N. J

MECHANICAL (Continued) Coombs, Howard A., McLachlen Bldg., 700 10th St., Washington, D. C. Cory, Russell G., 50 Church St., New York Cox, James W., Jr., 320 Broadway, New York Cravens, George W., Westfield, N. J. Cummings, Henry H., 110 High St., Boston, Cummings, L. T., care Drefs, Cummings & Drefs, Book Bldg., Detroit, Mich.
Cummings, W. W., 15 Winter St., Woburn, Mass. Cundall, Robert N., Pres., Cundall, Powell & Mosher (Inc.), 80 W. Genesee St., Buffalo, Dalley, A. H. Charles, 122 S. Michigan Ave., Chicago, Ill. Chicago, Ill.
Darlington, Wayne, Virginia Ave., Chester, Pa.
Dariiel, Thomas L., 4657 Aldrich Ave., S.,
Minneapolis, Minn.
Davis, Charles Ethan, 347 Madison Ave.,
New York, N. Y.
Davis, Charles Henry, Bass River, Mass.
Davol, Geo. K., 503 Market St., San Francisco, De Lancey, Darragh, 52 Pine St., Waterbury, Conn. Denk, F. J., 1216 House Bldg., Pittsburgh Pa. Denny, Omer, 58 Sutter St., San Francisco, Calif. Deverell, Spencer & Co. (Inc.), 514-517 Garrett Bldg., Baltimore, Md. Dobson, Wm. J. M., Red Lodge, P. O. Box 955, Montana Montana
Dock, Herman, Engineers' Club, New York
Dodge, Kern, State Road & Hellerman St.,
Tacony, Philadelphia, Pa.
Dollar, W. M., Buffalo, N. Y.
Donnelly, William T., 17 Battery Place, New Dorward, David, Jr., 16 California St., San Francisco, Calif. Francisco, Calif.
Dowd, Albert A., 25 Church St., New York City
Dowd, Wyllys, E., Jr., 111 Broadway, New York
Dreyfus, Edwin D., 14 Wood St., Pittsburgh, Pa.
Ducas, Charles, 206 Broadway, New York
Duncan, Harry L., Rooms 2407-2408, 55 Liberty
St., New York, N. Y.
Duryce, Andrew B., 39 Liberty Ave., New
Rochelle, N. Y. St., New York, N. Y.
Duryee, Andrew B., 39 Liberty Ave., New Rochelle, N. Y.
Dyer Co., 2031 Euclid Ave., Cleveland, O.
Dyer, William J., 3005 Claremont Ave., Berkeley, Cal.
Eadie, Freund & Campbell, 7 W. 45th St., New York
Rager, W. G., Waldosta, Ga.
Eastern Machinery & Equipment Co. (Inc.),
1036 Commercial Trust Bldg., Philadelphia,
Pa Pa. Egbert, Charles C., Gluck Bldg., Niagara Falls, N. Y. Rlicott, Edward B., Colonel C. W. S., U. S. A., Bldg. "C," 7th & B Sts., Washington, D. C. Ellingwood, Elliott L., 338 H. W. Hellman Bldg., Los Angeles, California Bllis, Frank I., 2126 Farmers Bank. Bldg., Pittsburg, Pa.

Ellison, Lewis M., 214 W. Kinzie St., Chicago, Ill.

Rirod, Henry E., 220 Interurban Bldg., Dallas, Terns A. H., Glenbrook, Conn. Rngel, Godfrey Sr., Construction Co., 17 Battery Pl., New York Engineering Sales Co. (Inc.), New Orleans, La.

Lacon, John E., 820 Otis Bldg., Chicgao, Ill.

Esselstyn, Murphy & Hanford, 810 Marquette

Bldg., Detroit, Mich.

Farmer, John T., 314 Coristine Bldg., Montreal,

Ouches Quebec assett, Francis K., 1302-1303 U. B. Bldg., Datyon, O.
Peldman, A. M., 145 W. 45th St., New York
Fergus, William L., 1509 Fisher Bldg., Chicago,

Fermier, E. J., College Station, Texas Fernald, R. H., University of Pa., Philadelphia, Fickes, Alfred C., 547 W. Chestnut St., Lancaster. Pa Fillingham, Myles P., 50 Church St., New York, N. Y. Findley, William D., Room 902, 141 Milk St., Boston, Mass.
Fink, J. B., 421 Security Bldg., Tulsa, Okla.
Finkle, Frederick C., 448-449 L. W. Hellman
Bldg., Los Angeles, Cal.
Fish, Charles H., 73 Tremont St., Boston, Mass.
Fitch, Claude E., 1033 Elmwood Ave., Wilmette, lack, Alonzo, 317 William St., East Orange, N. J. Flack, Flather, John J., 1100 Fifth St., S. E., Minneapolis, Minn.
Fletcher, E. L., 542 Fairfield Ave., Fletcher-Thompson (Inc.), Bridgeport, Conn.
Forbes, W. D., 1236 Hempstead St., New London, Conn. Fordyce, John R., Hot Springs National Park, Fournier, Thomas F., P. O. Box 1201, Providence, Fowler, Geo. L., 114 Liberty St., New York Franz, Walter G., Union Trust Bldg., Cin-cinnati, Ohio Fraser, John, 30 Church St., New York, N. Y. Freedley, Paul, 615 Witherspoon Bldg., Philadelphia, Pa. Freeman, Wm. J., 1745 Conway Bldg., Chicago, Freeman, W. M. J., 1740 Collway Bidg., Chicago, Ill.
Freyn, Brassert & Co., 122 S. Michigan Ave., Chicago, Ill.
Frick, John, 701 Denckla Bldg., Philadelphia, Pa.
Frohrieb, Louis C., 1116 House Bldg., Pittsburgh, Pa.
Fryer, Ross L., Commercial National Bank Bldg., Washington, D. C.
Fuel Engineering Co. of N. Y., 106 E. 19th St., New York
Furk, Nelson E., 150 Nassau St., New York
Furman, F. De R., Stevens Inst. of Tech.,
Hoboken, N. J.
Gage-Engineering Service Co., 1410 H Street,
N. W., Washington, D. C.
Gaines, Frederic F., 16th & Irving Sts., New
York, N. Y.
Gannon, Thomas J., 143 Liberty St., New York,
N. Y. III. Gardner & Lindberg, Marquette Bldg., Chicago, Gardner, Thomas M., 814 E. 23rd St., Indianapolis, Ind.
Garland, C. M., First National Bank Bldg., M., First National Bank Bidg., Chicago, Ill.
Gassman, Howard M,
Bldg., Birmingham, Ala. 848-9 Brown Marx Bldg., Birmingham, Ala.
Gates, Thayer P., 701 Grosvenor Bldg., Providence, R. I.

422-5 Wesley Roberts Bldg., Gearing, H., 633-5 Wesley Roberts Bldg., Los Angeles, Cal. Gebhardt, G. F., Armour Inst. of Tech., Chicago, III. Gerber, Samuel R., 309 Broadway, New York, N. Y. N. Y.
Gibbs, Harold E., 306 Niagara Life Bldg.,
Buffalo, N. Y.
Gibson Co., Geo. H., Tribune Bldg., New York
Givan, Albert, 1525 K St., Sacramento, Cal.
Godfrey, Foskett H., 502 Provident Bldg.,
Tacoma, Wash.
Goldie & McCullough Co. (Ltd.), W. Main St.,
S. Galt. Ont. Canada S., Galt, Ont., Canada Goldschmidt, Otto E., 116 W. 39th St., New York
Goss, Harry T., 48 New Chambers St., New York,
N. Y. Goubert, Aug. A., 90 West St., New York Gray, James H., 71 Broadway, New York, N. Y. Gray, John R., 686 Howard St., San Francisco Cal.

Green, Samuel M. Co., 293 Bridge St., Spring-field, Mass. Greenwood, T. T., 40 Court St., Boston, Mass. Grissinger, Elwood, 293 Lexington Ave., Buffalo, Grohmann, Carl L., 21 Beverly Rd., Hartford, Conn. Grossman, Albert, 112 Marlborough Rd., Brooklyn, N. Y.
Gunther, Charles O., Stevens Institute of Tech.,
Hoboken, N. J.
Guthrie, James, 420 Hickox Bldg., Cleveland, Ohio Hahn, Conrad V., P. O. Box 4039, Philadelphia, Halbfass, Arnold J., 11 Nischeweg, Berne, Switzerland Hamilton, James, Suite 503, Ouray Bldg., 8th & G Sts., Northwest, Washington, D. C. Hammer, Charles T., 35 Nassau St., New York, Hammer, Edwin, W., 160 Broadway, New York, Hammer, Edwin, W., 160 Broadway, New York, N. Y.
Hannah, Frederick A., 32 W. 40th St., New York Hanscom, William W., 848 Clayton St., San Francisco, Cal.
Hanzlik, Henry J., 281 North Main St., Wellsville, N. Y.
Hardesty, Frederick S., Commercial Natl. Bank Bldg., Washington, D. C.
Hardy, Clement A., Rm. 653 Railway Exchange Bldg., Chicago, Ill.
Harris, Ford W., 933 Higgins Bldg., Los Angeles, Calif.
Hartshorne, Wm. D., 40 Pleasant St., Methuen, Hartshorne, Wm. D., 40 Pleasant St., Methuen, Mass Hastings, Glen B., First Nat'l Bank Bldg., Williamsport, Pa. Hatfield, Robert L., 207 Market St., Newark, N. J.
Haven, H. M., & Crosby, Wm. W., 40 Court
St., Boston, Mass.
Hay, Paul L., 1421-Severn St., Pittsburgh, Pa.
Hayward, H. W., Mass. Inst. Tech., Cambridge, Heiner & Maysilles, Grafton, W. Va. Henderson, Geo. R., 1920 Chestnut St., Phila-delphia, Pa. delphia, Pa.

Henney, David H., 55 Liberty St., New York,
N. Y. Henry, William T., P. O. Box 152, Fall River, Mass Henshaw, Frederick V., 25 Nassau St., New York, N. Y. Herrick, Carl A., 3816 Thomas Ave., S., Minne-apolis, Minn.

72 Clinton St., Lakeport, Herrick, James A., 72 Clinton St., Lakeport, N. H. Hessenbruch, George S., Suite 920 Victoria Bldg., St. Louis, Missouri Hibbard, Henry D., 144 E. 7th St., Plainfield, N. J. Hibbard, R. L., Jenkins Arcade, Pittsburgh, Pa.
Hickman, Charles D., Bellevue Court Bldg.,
Philadelphia, Pa.
Hier, Frederick P., 120 Broadway, New York,
N. Y.
Hill, George F., 51 East 42nd St., New York, N. Hill, Nicholas S., Jr., 112 E. 19th St., New York, N. Y. Hiller, Joseph L., 21 S. 12th St., Philadelphia, Hoagland, Ira G., 80 Maiden Lane, New York Hoffman, J. D., Purdue University, Lafayette, Ind. Hogg, James, 7 Academy St., Amsterdam, N. Y. Hollis, French & Allen Hubbard, 88 Pearl St., Hollis, French & Allen Hubbard, 88 Pearl St., Boston, Mass. Holmes, Frederick S., 2 Rector St., New York Hott, Herbert F., 425-426 Holston Nat'l Bldg., Knoxville, Tenn. Honiss, William H., care Hartford-Fairmont Co., Hartford, Conn. Homolulu Iron Works Co., 233 Broadway, New York, N. Y.

Hope Engineering & Supply Co., Mt. Vernon, Ohio Hopps, John H., 503 Market St., San Francisco, Cal. Cal.
Houghton, Harry S., Atlas Bldg., 604 Mission St., San Francisco, Calif.
Hubbard & Harris (Inc.), Bridgeport, Coun.
Hugo, T. W., 221 W. 6th Ave., W. Duluth, Minn.
Hull, J. D., 354 Colman Bldg., Seattle, Wash.
Humphrey Gas Pump Co., 401 S. A. & K. Bldg., Syracuse, N. Y.
Hunicke, C. Campbell, 27 William St., New York. N. Y.
Hunt, Andrew M., 206 Broadway, New York,
N. Y. Hunt, Andrew M., 200 Broadway, New 102. N. Y.
Hutchens, Edward, 703 Wisconsin St., Eau Claire, Wisconsin Hutchison, Miller Reese, 51st Floor, 233 Broadway, New York
Hutton, S. E., Cleveland, Ohio
Iltis, John, Ivy Ave., Englewood, N. J.
Industrial Engineers Corp., Suite 920 Victoria Bldg., St. Louis, Missouri
Ingraham, Alexander, Calgary, Alberta, Canada Irvin, Richard, 712-713 Ferguson Bldg., Pittshurgh, Pa. burgh, Pa.

Irwin, Oliver C., 144 Court St., New York

Jackson, Francis W., 86 West Onedia St., Oswego, N. Y. Jackson, Leonard D., 56 Curtis Ave., Woodbury, Jacoby, Henry B., 95 Liberty St., New York Jellett, Stewart A. Co., 1718 Real Estate Trust Bldg., Philadelphia, Pa. Jenett, Stewart A. Co., 1718 Real Estate Trust Bldg., Philadelphia, Pa. Jenks, Richard P., 1035 Grosvenor Bldg., Provi-dence, R. I. Johnson & Benham, 150 Nassau St., New York Johnson, F. Amos, Box 649, New Haven, Conn. Johnson, Henry S., R. F. D. 14, Babylon, L. I., NV N. Y.
Johnson, Louis L., Attica, Ind.
Johnson, Nathan C., 149 Broadway, New York
Johnson, Paul F., Altadena, Cal.
Jordan, Samuel S., Scarborough, Me.
Kaighn, Herbert E., 2600 Harrison St., Wilmington, Del.
Keely, Royal R., care Macoy, 45 John St.,
New York
Keilholtz P. O. Continental Bldg. Baltimore. Keilholtz, P. O, Continental Bldg., Baltimore, Md.

Kelly, Thomas C., 605 2nd Natl. Bank Bidg.,
Cincinnati, O.
Kennedy, J. J., 52 Broadway, New York, N. Y.
Kennedy, Walter, Bessemer Bidg., Pittsburgh, Kennedy, William P., 1790 Broadway, New York, Kent, Henry R. & Co., 141 Broadway, New York, N. Y. N. Y.
Kent, R. S., Pres., R. S. Kent (Inc.), 50 Court
St., Brooklyn, N. Y.
Key, James F., Box 244, Sierra Madre, Calif.
Kidd, Andrew, Jr., 95 Liberty St., New York
Kimball, Richard D., 6 Beacon St., Boston, Mass. Kinney, J. N., 30 Church St., New York Kirsch, George H., Larkspur, Marin Co., Calif. Kitson, Frank C., Hobart Bldg., San Francisco, Calif. Calif.
Klepinger, John H., Brookston, Indiana
Koenig, Adolph G., 405 Lexington Ave., New
York, N. Y.
Kramer, Xavier A., Magnolia, Miss.
Krause, Arthur E., 25 Morris Ave., Mountain
Lakes, N. J.
Krummel, Louis C., 488 Nostrand Ave., Brooklyn, N. Y.
Kurtz, Walter H., 4043 Greer Ave., St. Louis,
Mo. Kuss, Robert H., 990 Old Colony Bldg., Chicago, Ill. Mo. Ladd, Jas. B., 1011 Chestnut St., Philadelphia, Pa.

Horace H., 2320 Dime Bank Bldg., De-

Lane.

MECHANICAL (Continued) Lang, J. Gustaf V., 8 W. 40th St., New York, Lang, Wm. H., 538 So. Dearborn St., Chicago, Ill. Lauder, George B., Concord, N. H. Lauer, Herbert H., 123 S. 16th St., Allentown, Pa Ledermann, Frank, 21 Park Row, New York Lee, Cazenove G., Jr., 3401 Newark St., Washington, D. C. Lee, William F., 713 E. Franklin St., Richmond, Leinert, Wenzel, 410 W. 23rd St., New York, N. Y. Lenston, Charles S., 36 Wellington St., Worcester, Mass. Leoni, A. M., care Steinmetz Electric Motor Car Corp'n, Baltimore, Md. Lewis, Jr., D. J., 277 Broadway, New York Lewis, Frederick H., Sunny Fields, Charlottes-Va. ville, Va. ewis, Joseph E., 1218 Warner St., Baltimore, Md. Lewis, Thornton, 1302 Land Title Bldg., Philadelphia, Pa.

Lewis, Warren B., 740 Grosvenor Bldg., Providence, R. I.

Libby, Malcolm, 39 William St., Worcester, Mass Mass.
Lide, Martin J., 905-6 Woodward Bldg., Birmingham, Ala.
Lincoln, Joseph B., care Engineering Experiment
Sta., Annapolis, Md.
Little & Shepard, 2033 Dime Bank Bldg.,
Detroit, Mich. Livingston, Robert R., 2 Rector St., New York, N. Y. Loomis, Evarts G., 207 Market St., Newark, N. J. Lorenz, Wm. A., 60 Prospect St., Hartford, Loss, Henrik V., Witherspoon Bldg., Philadelphia, Pa. Lovell, Alfred, 619 Harrison Bldg., Philadelphia, Pa. Lucke, Charles E., Columbia University, New York Luchrs, Daniel M., Ellaston Bldg., Cleveland, Lyons, James W., 1420 Carroll Ave., Chicago, McAuliffe, Pierce J., 17 Battery Place, New York, McClintock, C. H., 700 Tramway Bldg., Denver, Colo.
McColl, J. R., 2348 Denobscop Bldg., Detroit, Mich.
McDonald, Albert, 8 Nassau Boulevard, Garden
City, L. I., N. Y.
McHollan, James A., 116 E. 19th St., New York
McKee & Co., Arthur G., 1303 Rockefeller Bldg.,
Cleveland, O.
McLaren, A. R., 3014 Pierce St., San Francisco Calif. Calif.
MacLeod, Norman M., 16 W. Rockland St.,
Germantown, Philadelphia, Pa.
McMillan, William L., 3212 Benner St., Wissinoming, Philadelphia, Pa.
McMullin, F. V., Mt. Gretna, Pa.
Main, Charles T., 201 Devenshire St., Boston, Mass Malm Engineering Co., 588 Drexel Bldg., Philadelphia, Pa. Mandel, Arthur C., 56 Rast 87th St., New York, Manitus Engineering Co. (Inc.), 15 East 40th St., New York, N. Y. Marburg Brothers, (Inc.), 90 West St., New York Marks, Lionel S., Harvard University, Cambridge, Mass.

Marshall, Norman, 54 Windemere Road, Auburndale, Mass.
Marvin, Howard, 22 Mall St., Lynn, Mass. Massey, Geo. B. Co., People's Gas Bidg., Chicago, Ili.

Matlack, Ellwood V., 293 Thatcher Ave., River Forest, Ill. Matlock, Ch New York Chaucey, Rm. 816, 949 Broadway. Maxfield, Lewis S., P. O. Box 358, Islip, N. Y. Mayo, Edward H., 412 Traction Terminal Bldg., Indianapolis, Ind. Indianapolis, Ind.
Meaker, Guy L., 311 Campbell St., Joliet, Ill.
Mering, Barclay G., 400 Fletcher Am. Natl.
Bank Bldg., Indianapolis, Ind.
Meron, Frederic, 27 Cedar St., New York, N. Y.
Merrill, J. J., 220 E. Illinois St., Chicago, Ill.
Meyer, Strong & Jones (Inc.), 101 Park Ave.,
New York
Michel, A. Eugene, & Staff, 116 Nassau St.,
New York
Mickle, Robert T., 430 W. Stafford St., Philadelphia, Pa. delphia, Pa.
Miller, Frank L., Davis-Miller Engrg. Co.,
Parkersburgh, W. Va.
Miller, Herman G., 1021 W. Boone Ave., Spokane, Wash. Mills, Chas., 23 High St., Newton Upper Falls, Mass. Mass.
Misostow, Henry, 536 Rush St., Chicago, Ill.
Mole, Harvey E., 55 Liberty St., New York,
N. Y.
Moody, V. D., 90 West St., New York
Moody, William F., 6 Boston Bldg., Denver,
Colo. Colo.
Moore, Stanley H., Santa Barbara, Cal.
Moore, Stanley H., Santa Barbara, Cal.
Morgan, John D., 2 Rector St., New York, N. Y.
Morrin & Coddington, Phelan Bldg., San Francisco, Calif.

Albert Wood. 54 Buckingham St., cisco, Calif.

Morris, Albert Wood, 54 Buckingham St.,
Springfield, Mass

Mosher, Chas. D., 64 Reade St., New York,
N. Y.

Mount, Wm. D., 601 People's Nat'l Bank Bldg.,
Lynchburg, Va.

Moyer, James A., State House, Boston, Mass.
Muckle, M. R., Jr., 220 S. Broad St., Philadelphia. Pa. phia, Pa. Mudge, Sterling W., Pratt Institute, Brooklyn, N. Y. N. Y.
Murphy, Thomas R. H., Dayton, Ohio
Murray, Warren E., 826 Merchants' Exchange
Bldg., San Francisco, Calif.
Myers, David Moffat, 110 West 40th St., New
York, N. Y.
Nate, Emile H., 2320 Greenwood St., Pueblo, Nate, Emil Colorado Neale, William Mc C., P. O. Box 351, Greens-boro, North Carolina Neiler, Samuel G., 1490 Manhattan Bldg., Neiler, Samuel G., 1490 Manhattan Bldg., Chicago, Ill.
Nelson, Alfred C., 416 Rockefeller Bldg., Cleveland, O.
Newcomb, Edward C., North Scituste, Mass.
Newcomb, Robt. S., Palisade, N. J.
Newell, F. H., Urbana, Ill.
Newell, Wallace L., 1017 Alaska Building,
Seattle, Washington
Newhall, Ezra A., 1624 Pine St., Philadelphia,
Pa. Pa. Pa.
Nikonow, J. P., 5730 Grand Central Terminal
Bldg., New York, N. Y.
Norden, Carl L., 375 Fulton St., Brooklyn, N. Y.
Norelins, E. F., 430-31 Ardrus Bldg., Minneapolis, Minn. Norelius, E. F., 430-31 Ardrus Bidg., Minneapolis, Minn.
Norris, Alexander Murdoch, Chatard & Norris, 304 Continental Bidg., Baltimore, Md.
Nusbaum, Lee, 1119-21 N. Howard St., Philadelphia, Pa.
Offut, M. Webb, Georgetown, Kentucky
O'Neil, J. G., 33 So. Dearborn St., Chicago, Ill.
Orrok, Geo. A., 124 E. 15th St., New York, N. Y.
Osgood, John L., 45 Pearl St., Buffalo, N. Y.
Oswald, Harry A., Hamilton Motors Co., Grand
Haven, Mich.
Ott, Albert J., 32 N. Clinton St., Chicago, Ill.
Parker, Francis W., 1410 Marquette Bidg.,
Chicago, Ill.
Parkhurst, Frederick A., Rm. 2611, Grand Central Terminal Bidg., New York, N. Y.
Parks, Byron E. & Son, 625-26-27 Michigan
Trust Building, Grand Rapids, Michigan

Parsons, G. K. Corp'n, 29 Pine St., New York Parsons, H. de B., 22 William St., New York Paul, C. E., Armour Institute of Technology, 33rd & Federal Sts., Chicago, III. Pausin, Hugo R., 49 Liberty St., Allendale, N. I. N. I. Pearson, Robert H., The Rustic, Highlands, Penney, H. D., 9 Murray St., New York
Perkins, George H., 134 Batterymarch S.
Boston, Mass.
Peterson & Co., Frank P., 535 N. Cheyenne St., Tulsa, Okla.

Pfeffer, John E., Pfeffer-Mitchell Engrg. Co.,
901 Webster Ave., Chicago, Ill.

Pillsbury, Charles L. Co., 2nd & 12th Ave., St., Minneapolis, Minn.
Pittelkow, Arthur G., 312 Larned St., Detroit, Place, Clyde R., Grand Central Terminal, New York Mich Pollard, S. G., 1700 Wayne Ave., South Pasadena, Calif. Posey, James, 925 Fidelity Bldg., Baltimore, Md. Powers, James, Hotel Commodore, New York, N. Y. Prather, H. B., 664 Rockefeller Bldg., Cleveland, Price, Albert M., 825 Douglas Ave., Elgin, Ill. Prindle, H. B., 101 Park Ave., New York, N. Y. Proutt, F. G., 374 Randolph Bldg., Memphis, Tenn. Quick, Ray L., U. S. Naval Ordnance Plant, South Charleston, W. Va. South Charleston, W. Va.
Rabbitt, James A. Engineering Corp'n, 115
Boradway, New York, N. Y.
Radford, George S., cr. Halstead Specialties
Co., 503 Market St., San Francisco, Cal.
Railway & Industrial Engineers, (Inc.), 25 Broad
St., New York
Ramsdell, Thomas S., Housatonic, Mass.
Ramsey, George, 47th Floor, Woolworth Bldg.,
New York
Randolph, L. S., 5840 Bellona Ave., Baltimore. Randolph, L. S., 5840 Bellona Ave., Baltimore, Ransom, T. W., 1104 Merchants Exch. Bldg., San Francisco, Cal. Rasmussen, J. E., 715 No. 20th St., Omaha, Neb. Rautenstrauch, Walter, 43 Exchange Pl., New York Ray, Frederick, 15 Broad St., New York Raymond, Harold, 414 Macheca Bldg., New Orleans, La. Redfield, Edmund R., 301 2nd Ave., Sterling, III.
Reed, Van A., Jr., 1116 House Bldg., Pittsburgh, Pa.
Reeder, Charles L., Park Ave. & Saratoga, St., Baltimore, Md.
Reeve, Sidney A., St. Mark's Apts., New Brighton, S. I., N. Y.
Reimer, Arthur A., 45 S. Maple Ave., East Orange, N. J.
Republic Engineers (Inc.), 60 Broadway, New York Rice, Calvin W., 29 W. 39th St., New York Rich, Edward P., 1409 Manhattan Bldg., Chicago, Ill. Richardon, Chas. B., 35 East 41st St., New York, N. Y. Rider, Joseph B., 25 Cortlandt St., New York, N. Y. N. Y.
Riley C. L., Clark, MacMullen & Riley (Inc.),
101 Park Ave., New York
Riley, Lewis A. 2nd, Rm. 607, 103 Park Ave.,
New York, N. Y.
Rittman. W. F., Alpena, Mich.
Roberts, Odin, 209 Washington St., Boston, Mass Robinson, A. V Que., Canada. W., 14 Phillips Sq., Montreal, Robinson, Dwight P. & Co. (Inc.), 125 Bast 46th St., New York, N. Y. Roelker, C. J., State Bank Bldg, Richmond, Va. Regers A. A., Fidelity Bldg., Baltimore, Md.

Rogers, Chas. M., 710 Hibernia Bldg., New Orleans, La.
Rogers, Clarence M., 41 Fairview Ave., Daytona, Fla. Rollins, W. B. Engineering Co., 209 Railway Exchange Bldg., Kansas City, Mo. Roney, William R., 149 Broadway, New York Rose, F. W., Rose & Harris, Engrs., Auditorium Bldg., Minneapolis, Minn. Rosenzweig, Siegfried, 39 Cortlandt St., New York Ross, Charles E., 52 Beaver St., New York, N. Y. C. P. 102 Broadway, New York Rothwell, C. R., 192 Broadway, New York Runyon, Frederick O., 845 Broad St., Newark, Russell, James G., 54 Stanley St., Dorchester, Mass. Sealfrank, John M., 207 W. Tabor Rd., Philadelphia, Pa.

Salisbury, Royal D. Co., 1600 Downing St.,
Denver, Colo.

Sanderson & Porter, 52 William St., New York
Sando, Will J., 1013-16 Wells Bldg., Milwaukee,
Wie Sargent, John W., 303 Benefit St., Providence, Satherberg, Carl H., 1752 N. 26th St., Philadelphia, Pa.
Scguttler, Carl H., 731 Spitzer Bldg., Toledo, Schaphorst, William F., Tribune Bldg., New York Schirmer, Carl E., 1407 Prospect Ave., Toledo, Ohio Ohto Schloss, Newton L., 531 W. 143rd St., Apt. 64., New York Schoenborn, William E., McGill Bldg., Wash-ington, D. C. Schoenijahn, Robert P., Church Bld. mington, Del. Schreck, H., 718 Cattell St., Easton, Pa. Schuetz, F. F., 50 Church St., New York Robert P., Church Bldg., Wil-Schwab, Gustav, 525 Market St., San Francisco. Calif. Scott, Arthur C., 1816¹/₂ Main St., Dallas, Texas Scott, James B., 503 S. 46th St., Philadelphia, Pa. Scrivenor, Arthur, Mutual Bldg., Richmond, Seavey, Chas. L., 1921 Holland Ave., Utica, N. Y. Shadgen, Joseph F., P. O. Box 622, Pittsburgh, Pa.
Shaw, Louis E., 179 North Parkway, Bast Orange, N. J.
Sherman, W. D., 222 N. Wilton Place, Los Angeles, Cal.
Shiebler, Marvin, 80 Broadway, New York, N. V. Simmons, Herman R., F. O. Dale, Rhode Island Sintz, Claude, 311 Marquette Bidg., Detroit, Mich.
Slaughter, Benjamin G., 1209-10 Stephen
Girard Bldg., Philadelphia, Pa.
Slining, B. G., Carlinville, III.
Smith, Edward J., 30 Church St., New York
Snow, Sylvester M., 55 Kilby St., Boston, Mass.
Soben, A. F., Box 137, So. Amboy, N. J.
Spackman, Henry S., 2024 Arch St., Philadelphia Pa. phia, Pa. Stevens, John A., 8 Merrimack St., Lowell, Mass. Lock, W. A., 210 Syndicate Bldg., Oakland, Stock, Calif. Calif.

Street, Clement F., Box 353, Greenwich, Conn.

Strouse, Sidney B., 429 Guarantee Trust Bldg.,

Atlantic City, N. J.

Stucki, Arnold, Oliver Bldg., Pittsburgh, Pa.

Stumpf-Una-Flow Ragine Co. (Inc.), 401 S. A. &

K. Bldg., Syracuse, N. Y.

Suck, Adolph, Hyde Park Station, Boston, Mass.

Sutton, Frank, 140 Cedar St., New York

Swartwout, Everett W., 20 Lafayette St., White

Plains, New York

Sweeney, John M., 729 Monadnock Block. Chi-Sweeney, John M., 729 Monaduock Block, Chicago, Ill.

phia, Pa.

MECHANICAL (Continued) Switzer, John A., University of Tenn., Knox-ville, Tenn. Symons, Wilson E., 900 Postal Telegraph Bldg., Chicago, III.

Syracuse Industrial Gas Co., 206 McCarthy
Bldg., Syracuse, N. Y.

Taggart, James M., 1170 Broadway, New York
Tappan, Charles O., 2 Rector St., New York,
N. Y. Taylor, A. J. T., 607 Credit Foncier Bldg., Vancouver, B. C., Canada Taylor, Percey B., Essez Bldg., Newark, N. J. Tenney, Charles H. & Co., 201 Devonshire St., Boston, Mass. Thomas, David G., Hotel Metropole, Denver, Thomas, Percy H., 120 Broadway, New York, Thompson & Lichtner, 136 Federal St., Boston, Mass. Thompson, Hugh L., Waterbury, Conn.
Thomson, J. Stewart, 95 Liberty St., New York,
N. Y. Thomson, Samuel G., 125 Riverside Drive, New York York
Thornton, W. F., 5713 Appletree St., Philadelphia, Pa.
Tobey, William L., 74 Washington Ave., Winthrop, Mass.
Toltz, King & Day. (Inc.), 1410 Pioneer Building, St. Paul, Minn.
Tomlines, Thomas L., 317 City Bank Bldg., Syracuse, N. Y.
Tomlinson, Royal D., 2322 Main St., Buffalo, N. V. N. Y. Tuska, Gustave R., 68 William St., New York, N. Y. Tyng, Arthur, 810 Iroquois, Bldg., Buffalo, N. Y. Ulmann, Carl J., 113 Grand St., New York, N. Y. Unger, John S., 3344 Broadway, Chicago, Ill. U. S. Products Corp'n, 1423 McCormick Bldg., Chicago, Ill. Van Law, Carlos W., 120 Broadway, 3123 Rquitable Bldg., New York, N. Y. VanWinkle, Edw., 37 Wall St., New York Varney, William W., 1229 Calvert Building, Varney, William W., 1229 Caivert Busseller, Baltimore, Md.
Vaughn, Aubrey W., West Brookfield, Mass.
Vaughn, John F., 185 Devonshire St., Boston, Mass. Vehslage, H. E., 81 Fulton St., New York Vickess, Samuel, 129 Front St., New York Vincent, S. Arthur, 225 W. 86th St., cr. The Belnord Apts., New York Waddell, Charles E., 78 Patton Ave., Asheville, N. C. Wadsworth, Frank L. O., Box 1, East Liberty Sta., Pittsburgh, Pa. Wagner, Hugh K., 211 Calumet Bldg., St. Louis, Mo. Wainright, Arthur V., 49 Wall St., New York, N. Y. N. Y. Waite, Edward B., Drawer 946, Westboro, Mass. Waitt, Arthur M., Sharon, Conn. Walker, Gilbert S., 916 Park Bldg., Pittsburgh, Walser, Arthur, 58 Warren St., New York, N. Y. Walther, Arthur C., Pikeville, Ky. Weaver & Kemble, 5103 Euclid Ave., Cleveland, Ohio Webster, Wm. R., 411 Walnut St., Philadel-phia, Pa. Wells, Frederick L., 101 S. Clinton St., Chicago, Illinois Wells, J. Leland, 1328 Broadway, New York, N. Y. Westcott & Mapes (Inc.), 207 Orange St., New Haven, Conn. Weston, Burt H., 402 Commercial Bldg., Dayton, O. Whinery, Samuel B., 95 Liberty St., New York White, B. Milton, 324 Wilcox Bldg., Los Angeles, Calif. Whitham, Jay M., 607 Bullitt Bldg., PhiladelWhiting, Charles W., 148 State St., Boston, Mass. Whittlesey, James T., Claus Spreckles Bldg., San Francisco, Calif. Wieland, C. F., 1803 Claus Spreckles Bldg., San Francisco, Cal. Wilbur, Raiston T., Olympic Club, San Francisco, Cal. Wilbur, T. H. (Ica), 42 W. 2011 Ca. cisco, Cal.
Wilhelm, T. H. (Inc.), 42 W. SPILL C.,
York, N. Y.
Wilke, William, 86 Norwood Ave., Buffalo, N. Y.
Wilkinson, Thomas L., 406-407 Boston Bldg.,
Denver, Colo.
Williams, N. N., 3216 Prospect St., Kansas williams, N. N., 3210 Prospect St., Kansas City, Mo.
Wilson, James E., 205 W. 122nd St., New York
Winestock, Otto C., Perkinsville, Vt.
Witter, Charles J., 848 Virginia St., Toledo. Wolcott, Henry A., New Britain Ave., West Hartford, Conn. Wood, Albert C., 1203 Stock Exchange Bldg., Wynnefield, Philadelphia, Pa. Wood, Arthur J., 410 Allen St., State Cellege. Pa. Wood, Wm. H., 10 South Ave., Media, Pa. Woodwell, J. E., 501 Fifth Ave., New York, Woodwell, J. B., 601 Filta Ave., Acc., N. Y.
Wright, Percy E., 2012 L. C. Smith Bldg.,
Seattle, Wash.
Wunsch & Washburn, 487 Broadway, New York
Wyer, Samuel S., 1014 Hartman Bldg., Columbus, O. Zamboni, Lawrence, 50 Church St., New York,. Zimmerman, Fred R., 1313 Early Ave., Edge-water Sta., Chicago, Ill. **METALLOGRAPHY** -Non-ferrous Bierbaum, Christopher H., 1011 Mutual Life Building, Buffalo, N. Y. **METALLURGICAL** Freyn, Brassert & Co., 122 S. Michigan Ave., Chicago, Ill. Hollis, Henry L., 1025 Peoples Gas Bldg., Chicago, Ill. Kaufman, Emanuel, 2 Rector St., New York, N. Y. Kinkead, J. A., Rialto Blog., San Francisco, Calif. McGregor, A. Grant, Warren, Arizona.
Moldenke, Dr. Richard, Watchung, N. J.
Railway & Industrial Engrs. (Inc.), 25 Broad
St., New York Robinson, Louis G., 31 E. 4th St., Cincinnati, O. Waldo, Leonard. 14 Wall St., New York Iron and Steel Addicks, Lawrence, 51 Maiden Lane, New York, N. Y. Colby, Albert Ladd, Brighton St., Bethlehem, Hastings, Glen B., First Nat'l Bank Bldg., Williamsport, Pa. McLain's System (Inc.), Milwaukee, Wis. MILL ARCHITECTS Baxter, Burke M., 512 Meriam Bldg., 5716 Ruclid Ave., Cleveland, Ohio Fletcher, E. L., 542 Fairfield Ave., Fletcher-Thompson (Inc.), Bridgeport, Conn. Lockwood, Greene & Co., 60 Federal St., Boston, Mose Taylor, Percy B., Essex Bldg., Newark, N. J. -Paper Carey, James L., 208 N. Laramie Ave., Chicago, TII. MILLS (See also Brass, Paper, Pipe, Pulp, Rolling, Steel, Textile, Wire) Brown & Co., Edward C., 220 Devonshire St., Boston, Mass.

De Wolf, John O., 45 Bromfield St., Boston, Mass.
Leary, Frank J., Leary & Walker, Times Bldg.,
New Bedford, Mass.

Mass.

Lockwood, Greene & Co., 60 Federal St., Beston, ...

Main, Chas. T. 201 Devonshire St., Boston, Mass. Makepeace, Chas. R., Box 1146 Providence, R. I. Richmond, Knight C., 10 Weybosset St., Providence, R. Simmons, Herman R., F. J. By Dale, Rhode Island Sutton, Frank, 140 Cedar St., New York Herman R., P. O. Box 446, Peace MINING (See also Geological) Brown, Herman E., 115 Broadway, New York Brown, Holcombe J., 20 Beacon St., Boston, Mass. Mass.
Brunton, D. W., 730 Symes Bldg., Denver, Colo.
Conklin, H. R., Joplin, Mo.
Foster, Rufus J., 826 Manhattan Ave., Brooklyn, N. Y.
Hammond, John Hayes, Lookout Hill, Gloucester, Mass.
Henning, John L., Lake Charles, La.
Hollis, Henry L., 1025 Peoples Gas Bldg., Chicago, Ill. cago, Ill.
Lauer, Herbert H., 123 So. 16th St., Allentown, Pa.
Norris, R. V., 524 2nd Nat'l Bank, Wilkes-Barre, Pa.
Pabbling Percy A., Rm. 1001, Hobart Bldg., Robbins, Percy A., Rm. 1001, Hobart Bldg., San Francisco, Cal. Roney, William R., 149 Broadway, New York Sulphur Henning, John L., Lake Charles, La. Surface Massey, Geo. B. Co., Peoples Gas Bldg., Chicago, Ill. MINING PLANTS
Behr, H. C., 2 Rector St., New York
Hatfield, Robert L., 207 Market St., Newark, N. J. COTION STUDY Gilbreth, Frank B. (Inc.), 68 Eagle Rock Way, Montclair, N. J. MOTOR TRUCKS Myers, Cornelius T., Box 25, Avenel, N. J. U. S. Products Corp'n, 1423 McCormick Bldg., Chicago, Ill. 'eaver & Kemble, 5103 Euclid Ave., Cleve-Weaver Whitte, Captain, 219 W. 81st St., New York MUNICIPAL Allen, Henry A., Room 23, No. 154 West Ran-dolph St., Chicago, Ill. Tolts, King & Day (Inc.), 1410 Pioneer Build-ing, St. Paul, Minn.

N

Almert, Harold, 209 S. La Salle St., Chicago,

MATURAL GAS

TII

Hope Engineering & Supply Co., Mt. Vernon, Ohio
Wyer, Samuel S., 1014 Hartman Bldg., Columbus, Ohio
MATURAL GAS PLANTS
Peterson & Co., Frank P., 535 N. Cheyenne St.,
Tulsa, Okla.
MAVAL (See also Marine)
Bratt & Petersen, Hackensack, N. J.
Hardesty, Frederick S., Commercial Nat'l Bank
Bldg., Washington, D. C.
Norden, Carl L., 375 Fulton St., Brooklyn, N. Y.
MAVAL ARCHITECTS
Fryer, Ross L., Commercial National Bank
Bldg., Washington, D. C.

0

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Chicago III. Paker, Francis W., 1210
Chicago, Ill.
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Ramsey, George, 47th Floor, Woolworth, Bldg.,
New York

Gdin. 209 Washington St., Boston, Mass.

McGill Bldg., Wash-New York
Roberts, Odin, 209 Washington St., Boston, Mass.
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Smith, Dyer, 32 Liberty St., New York, N. Y.
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Baltimore, Md. Stock, W. William W., 1229

Baltimore, Md.
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Hopkins, M. S., 8 E. Long St., Columbus, O. Hurd, Charles H., 1405 Merchants Bank Bldg., Indianapolis, Ind.
Kent, R. S., Pres., R. S. Kent (Inc.), 50 Court St., Brooklyn, N. Y.
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Magruder, Wm. T., Ohio State University, Columbus, O.

Moore, W. B. & Co., 706 Union Bank Bldg., Pittsburgh, Pa.

Neale, William Mc C., P. O. Box 351, Greensboro, North Carolina

Norton, Fred E., 656 Main St., Worcester, Mass. Orrok, Geo. A., 124 E. 15th St., New York, N. Y.

Place, Clyde, R., Grand Central Terminal, New York, N. Y.

Posey, James, 925 Fidelity Bldg., Baltimore, Md. Powell, W. B., Cundall, Powell & Mosher (Inc.), 80 W. Genesse St., Buffalo, N. Y.

Richardson & Gray, 220 Devonshire St., Boston, 9, Mass.

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Denver, Colo.
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Germantown, Philadelphia, Pa.
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Allen, Charles M., Worcester Polytechnic Inst., Worcester, Mass.

-Laboratory Christie, A. G., Johns Hopkins University, Baltimore, Md. Electrical Testing Laboratories, 80th St. & East End Ave., New York Gebhardt, G. F., Armour Inst. of Tech., Chicago, Le Page, C. B., Stevens Inst. of Tech., Hoboken,

Mudge, Sterling W., Pratt Institute, Brooklyn, N. Y.

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Dayton, Ohio
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Indianapolis, Ind.
Modern Engineering Co., 318 Broadway, New
York, N. Y.

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TRACKLESS TROLLEYS Rossman, J. G., Scotch Plains, N. J.

TRACTORS

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TRAMWAYS

--Wire Rope Newell, Wallace L., 1017 Alaska Bldg, Seattle, Wash.

TRANSPORTATION

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TUNNELS
Thomson, T. Kennard, 50 Church St., New York, N. Y.

V

VALVES

Steere Engineering Co., Woodward & Horton Aves., Detroit, Mich.

VALUATION (See also Appraisals)
Almert, Harold, 209 S. La Salle St., Chicago,

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Cooley-Marvin Co., 15 Ashburton Place, Boston, Mass.
Fassett, Francis K., 1302-1303 U. B. Bldg., Dayton, Ohio
Hubbard & Harris (Inc.), Bridgeport, Conn.
Hoxie, Geo. L., 50 East 41st St., New York
Landreth, Olin Henry, 156 Fifth Ave., New York, N. Y.
Mullergen, Arthur I. Firestone Bldg. Kanssa

Mullergren, Arthur L., Firestone Bldg., Kansas City, Mo. Scott, Arthur C., 18161/2 Main St., Dallas, Scott, Texas Spackman, Henry S., 2024 Arch St., Philadel-

phia, Pa. Swain, Geo. F., Harvard University, Cambridge,

Tyng, Arthur, 810 Iroquois Bldg., Buffalo, N. Y.

-Industrial Plants

Richmond, Knight C., 10 Weybosset St., Providence, R. I.

Public Utilities

Allison, James E. & Co., Security Bldg., St. Louis, Mo.
Day & Zimmermann (Inc.), 611 Chestnut St., Philadelphia, Pa.

VAULTS

Holmes, Frederick S., 2 Rector St., New York, N. Y.

VENTILATING (See also Heating and Ventila-ting, Paper Mills)
Goubert, Aug. A., 90 West St., New York
Landvoigt, Thomas E., Room 102, Municipal Bldg., Washington, D. C.

VIBRATIONS.

Webster, Arthur Gordon, Clark University, Worcester, Mass.

W

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Block, Chicago, Ill.
Brown, John Wilson Jr., 1213 Filbert St., Philadelphia, Pa.
Broome, Ernest L., 49 Wall St., New York City
Bunnell, S. H., 103 Park Ave., New York, N. Y.
Syracuse Industrial Gas Co., 206 McCarthy
Bldg., Syracuse, N. Y.

WASTE UTILIZATION

Lewis, D. J. Jr., 277 Broadway, New York, N. Y.

WATER SUPPLY

Wainright, Arthur V., 49 Wall St., New York, N. Y.

WATER SUPPLY SYSTEMS

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Wood, Albert C., 1203 Stock Exchange Bldg.,
Wynnefield, Philadelphia, Pa.

WATER WORKS

Beaubien, James A., 50 East 42nd St., New York
Cantell, Mark T., 707 Union Trust Bldg.,
Winnipeg, Manitoba, Canada
Holland, Ackerman & Holland, Lawrence Bldg.,
Ann Arbor, Mich.
Koebig, A. W., 841 Title Insurance Bldg., Los
Angeles, Cal.
Salisbury, Royal D., 1600 Downing St., Denver,
Colo. York

Colo.

WELDING

Posey, James, 925 Fidelity Bldg., Baltimore, Md. Smith, H. S., 30 E. 42nd St., New York, N. Y. WELDING, ELECTRIC
Adams, C. A., 33 West 39th St., New York,
N. Y.

-Electric and Oxy-Acetylene Sessions, Frank L., Rockefeller Bldg., Cleveland, Ohio

--Oxy-Acetylene Smith, H. S., 30 E. 42nd St., New York, N. Y.

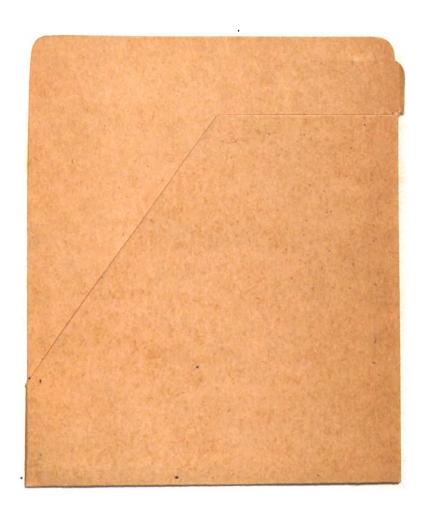
WIRE MILLS American Industrial Engrg. Co., Monadnock Block, Chicago, Ill.

WOODWORKING MACHINERY
Neale, William McC., P. O. Box 351, Greens-boro, North Carolina

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